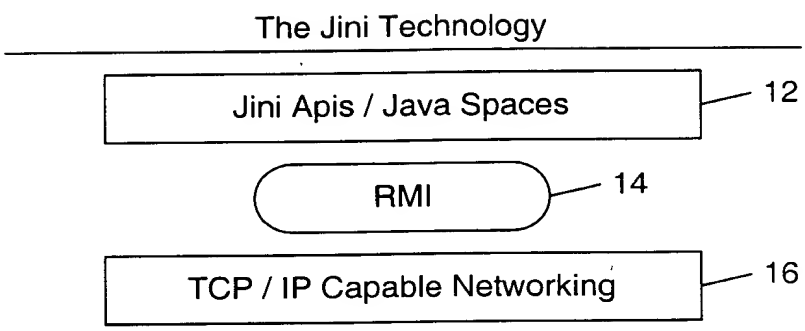


Fig. 1
(Prior Art)

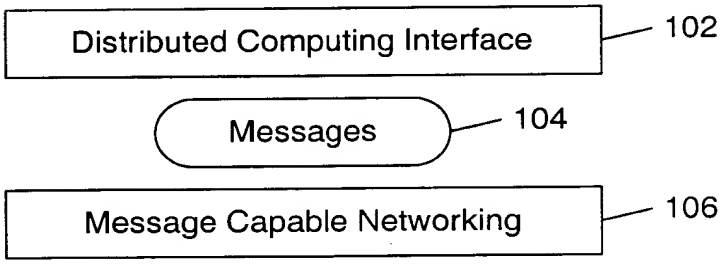


Fig. 2

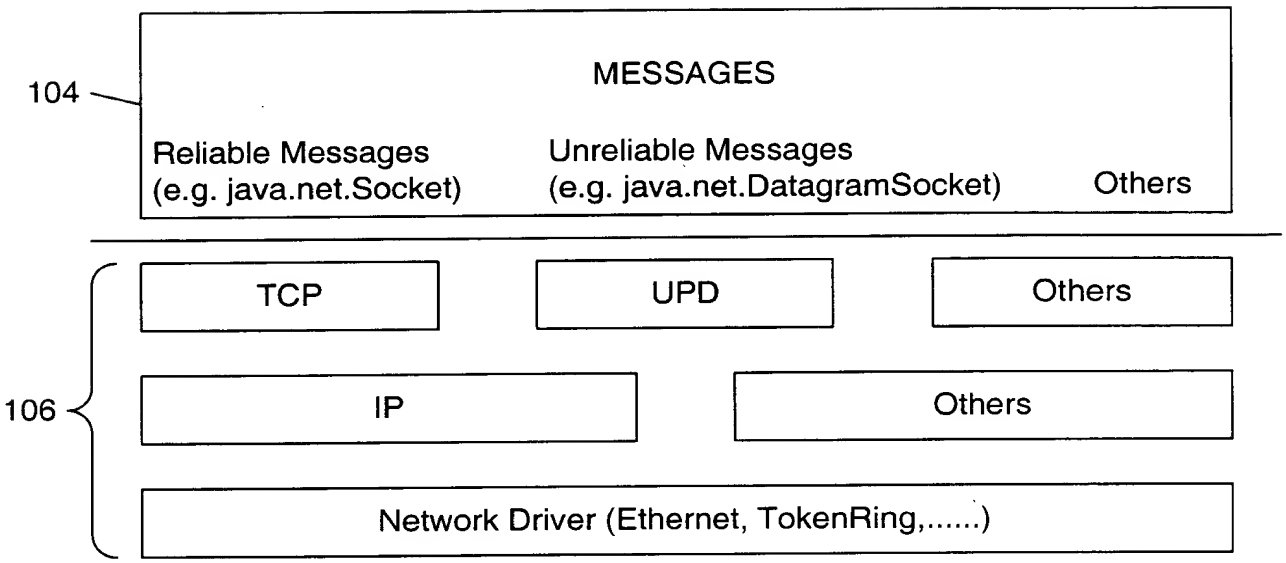

104
MESSAGES
Reliable Messages
(e.g. java.net.Socket)
Unreliable Messages
(e.g. java.net.DatagramSocket)
Others
106
TCP
UPD
Others
IP
Others
Network Driver (Ethernet, TokenRing,.....)

Fig. 3

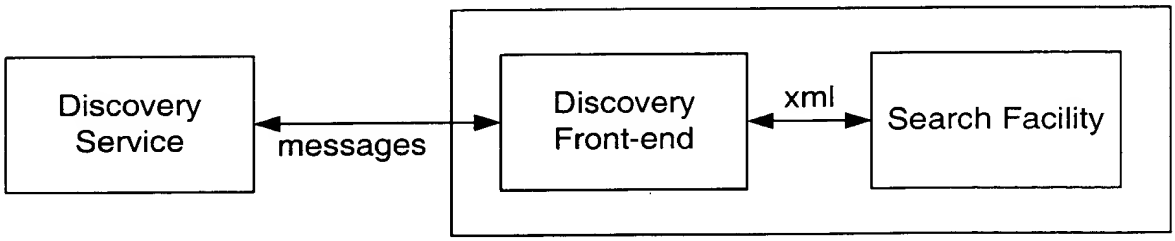

Discovery
Service
messages
Discovery
Front-end
xml
Search Facility

Fig. 4

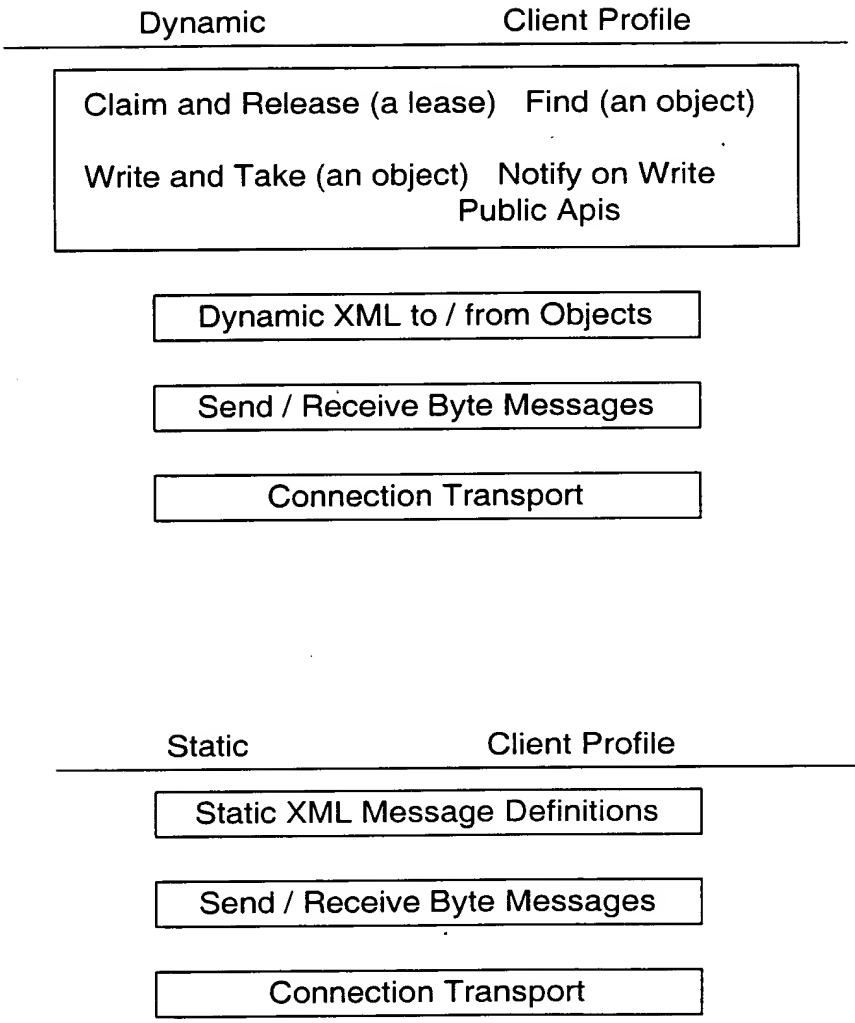

Dynamic
Client Profile
Claim and Release (a lease)
Find (an object)
Write and Take (an object)
Notify on Write
Public Apis
Dynamic XML to / from Objects
Send / Receive Byte Messages
Connection Transport
Static
Client Profile
Static XML Message Definitions
Send / Receive Byte Messages
Connection Transport

Fig. 5

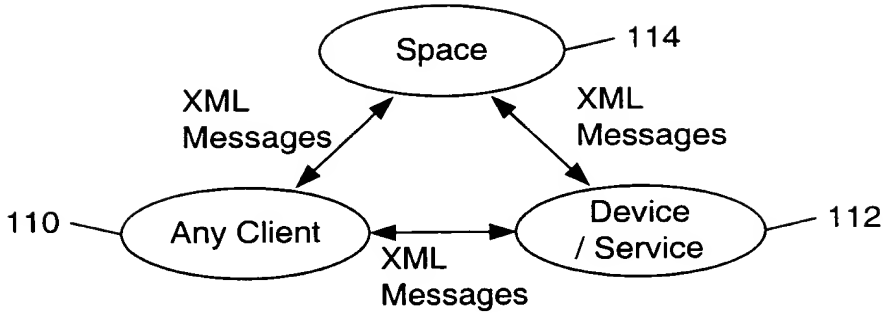

Space
114
XML
Messages
XML
Messages
110
Any Client
Device
/ Service
112
XML
Messages

Fig. 6

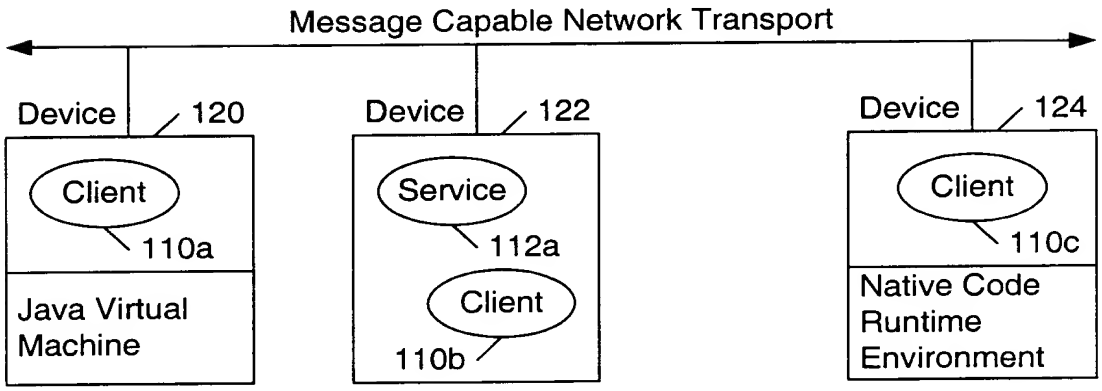

Message Capable Network Transport
Device
120
Client
110a
Java Virtual
Machine
Device
122
Service
112a
Client
110b
Device
124
Client
110c
Native Code
Runtime
Environment

Fig. 7

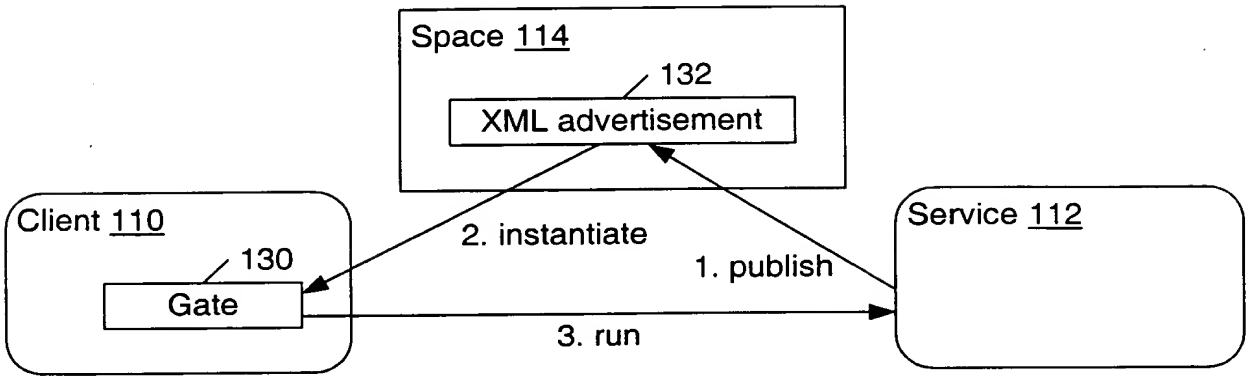

Space 114
132
XML advertisement
Client 110
130
Gate
2. instantiate
1. publish
3. run
Service 112

Fig. 8

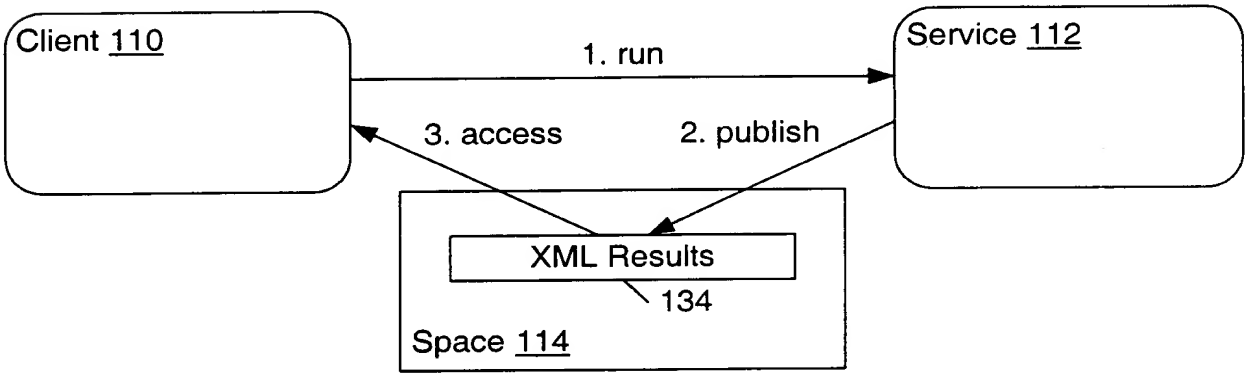

Client 110
1. run
Service 112
3. access
2. publish
XML Results
134
Space 114

Fig. 9

09/15/2004, EAST Version: 1.4.1

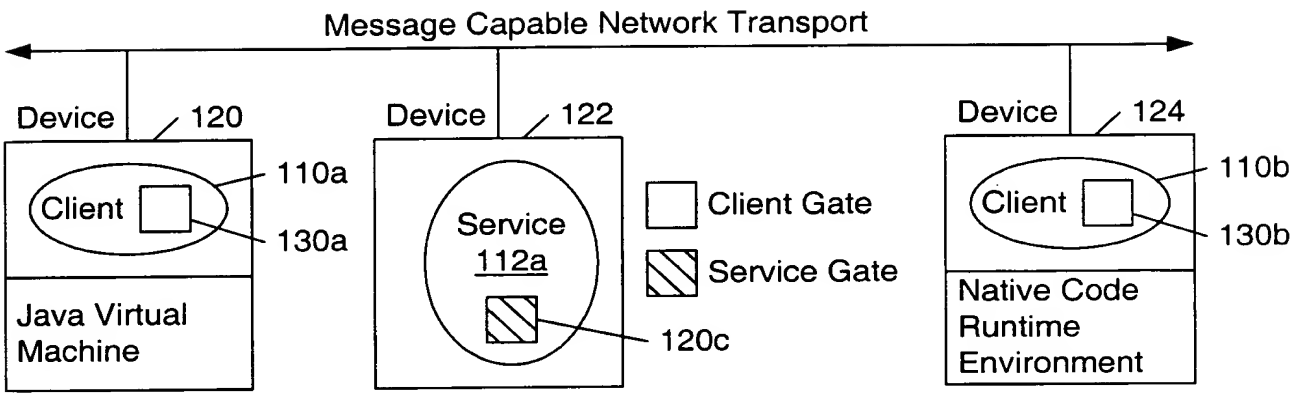


Fig. 10a

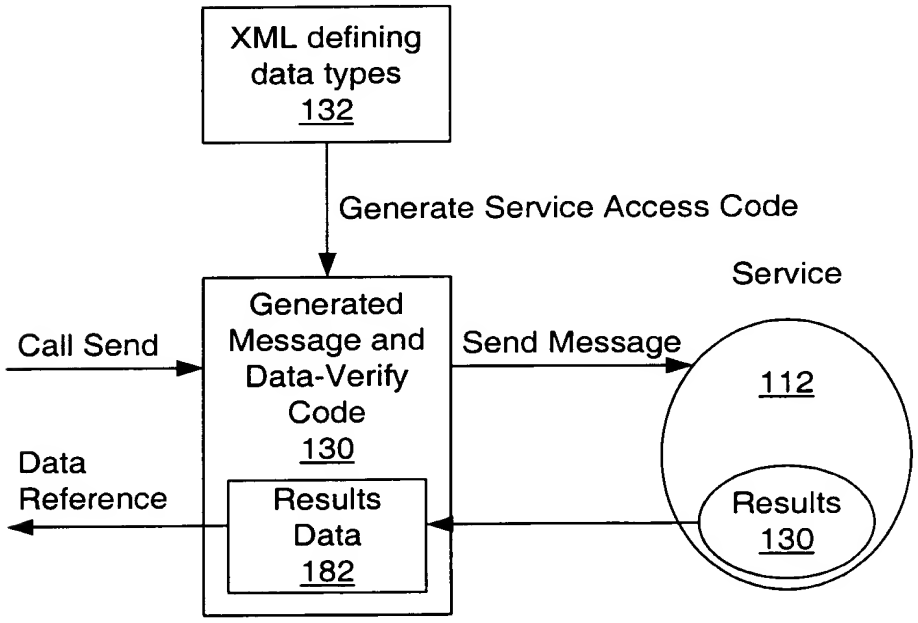


Fig. 10b

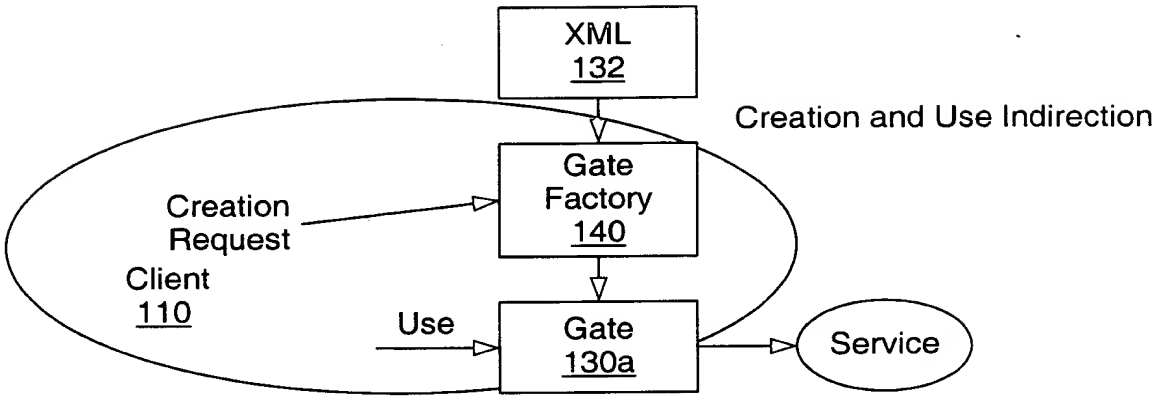


Fig. 11a

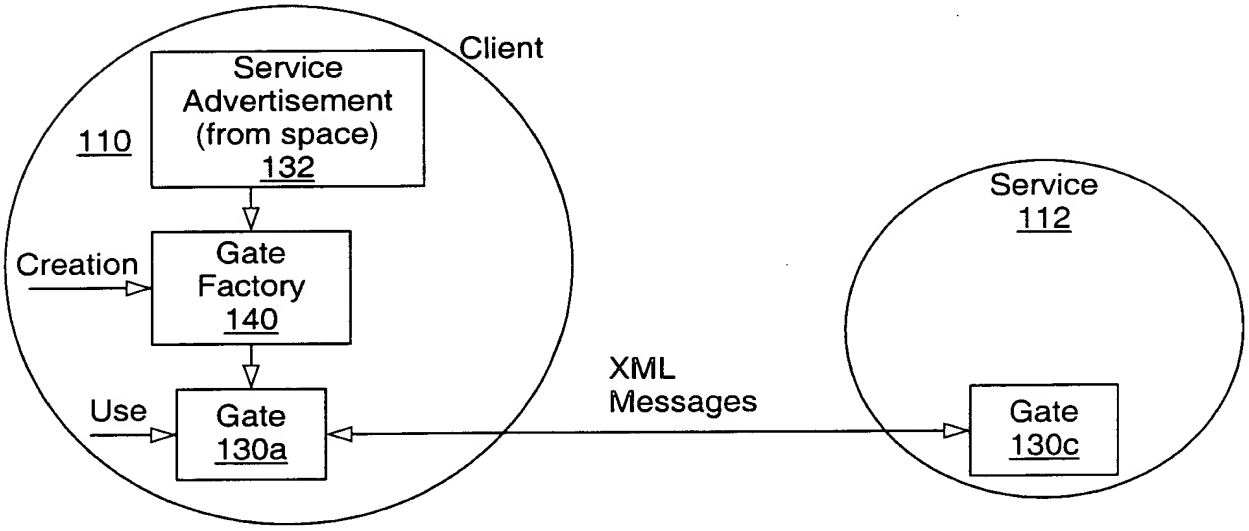


Fig. 11b

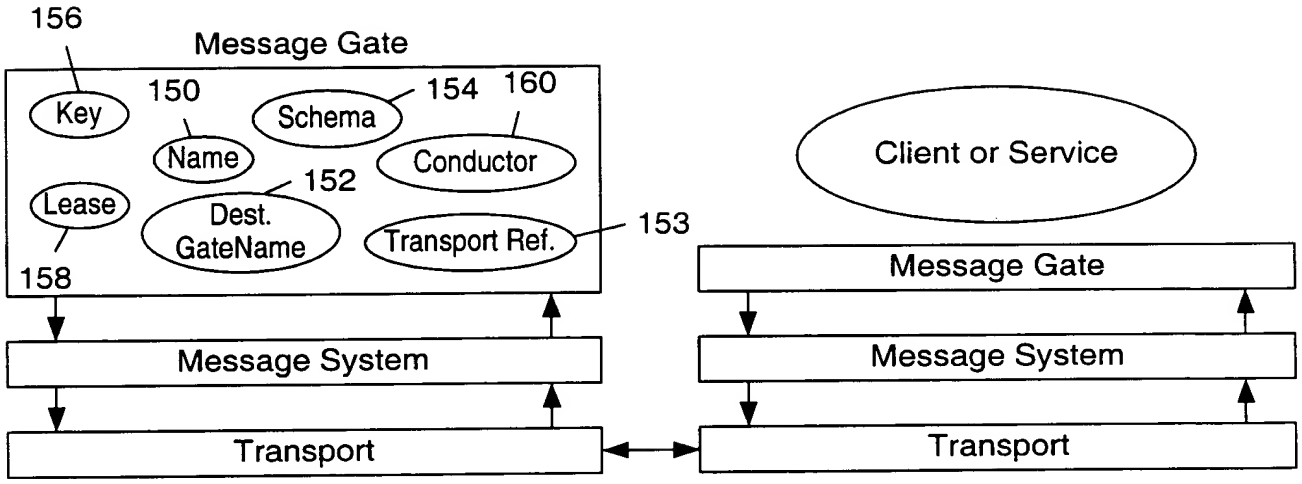

156
Message Gate
150
154
160
Key
Schema
Name
Conductor
152
Lease
Dest.
GateName
Transport Ref.
153
158
Client or Service
Message Gate
Message System
Message System
Transport
Transport

Fig. 12

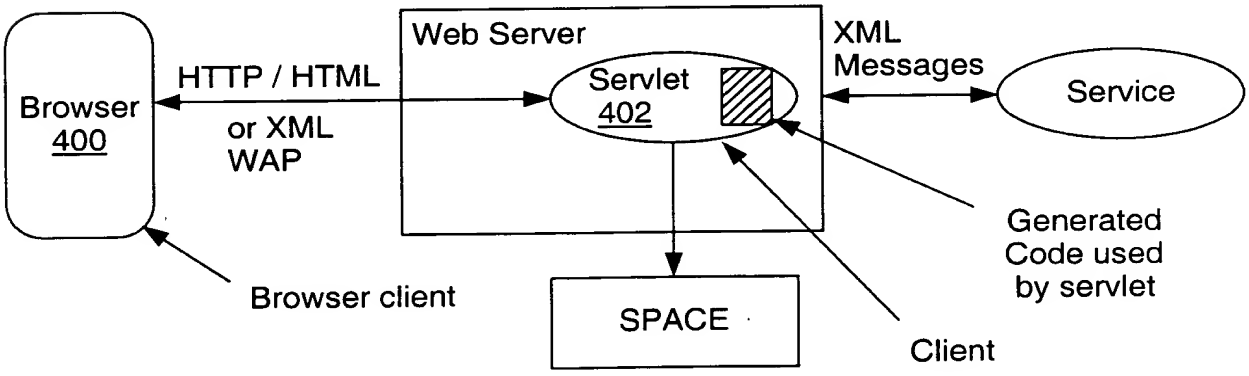

Web Server
XML
Messages
Browser
400
HTTP / HTML
or XML
WAP
Servlet
402
Service
Generated
Code used
by servlet
Browser client
SPACE
Client

Fig. 13

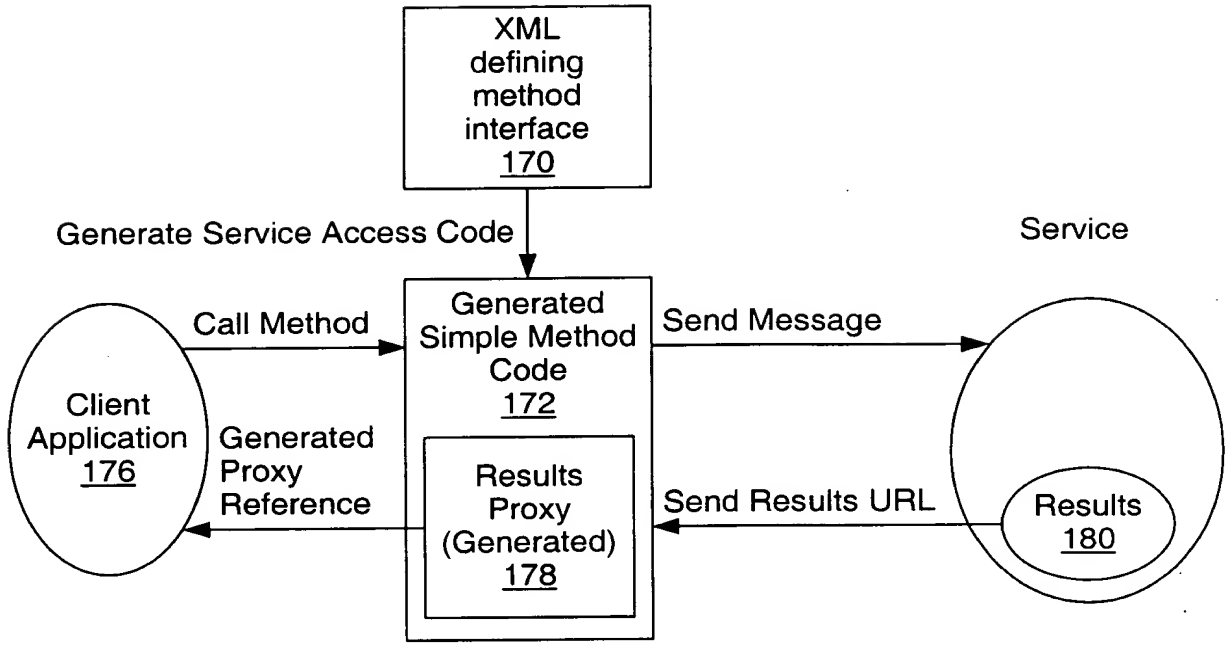

XML defining method interface 170
Generate Service Access Code
Service
Call Method
Generated Simple Method Code 172
Send Message
Client Application 176
Generated Proxy Reference
Results Proxy (Generated) 178
Send Results URL
Results 180

Fig. 14

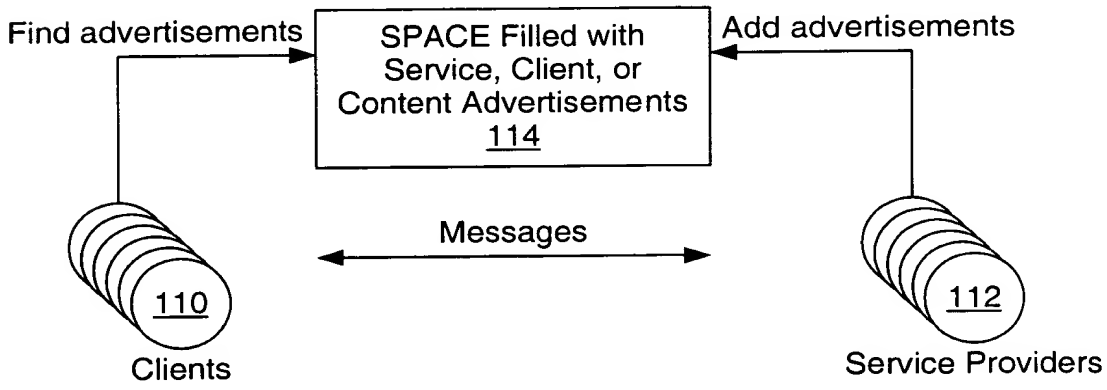

Find advertisements
SPACE Filled with Service, Client, or Content Advertisements 114
Add advertisements
Messages
110
Clients
112
Service Providers

Fig. 15

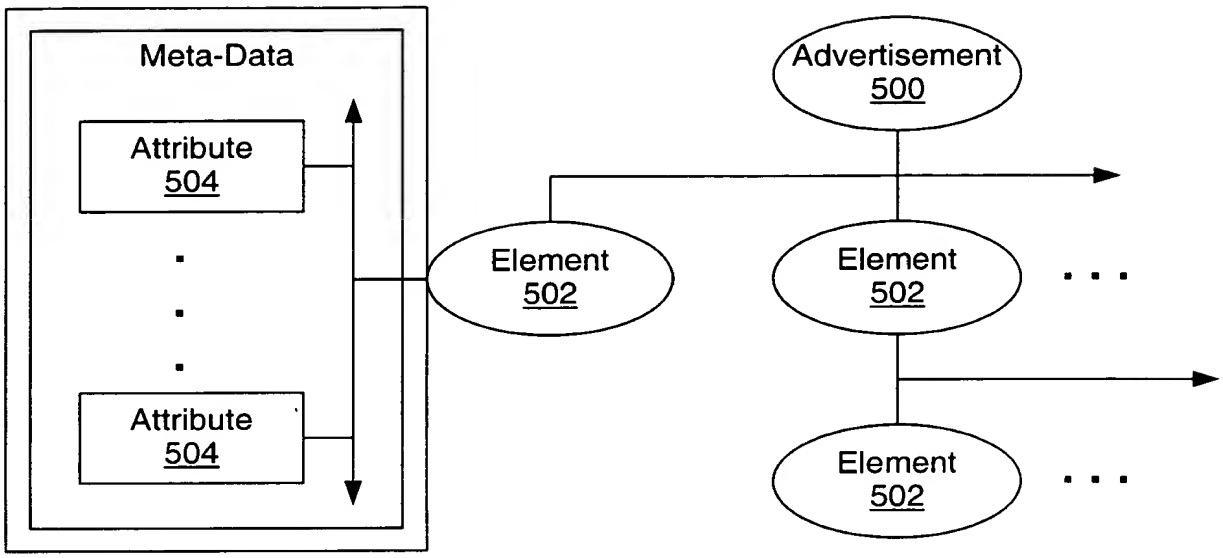

Meta-Data
Attribute
504
Attribute
504
Advertisement
500
Element
502
Element
502
Element
502

Fig. 16

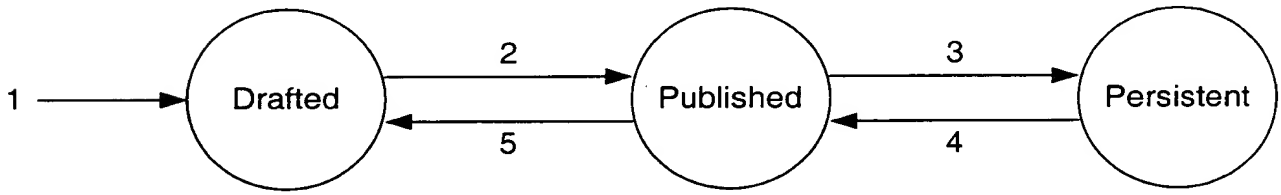

1
Drafted
2
5
Published
3
4
Persistent

Fig. 17

006707 T2E6960

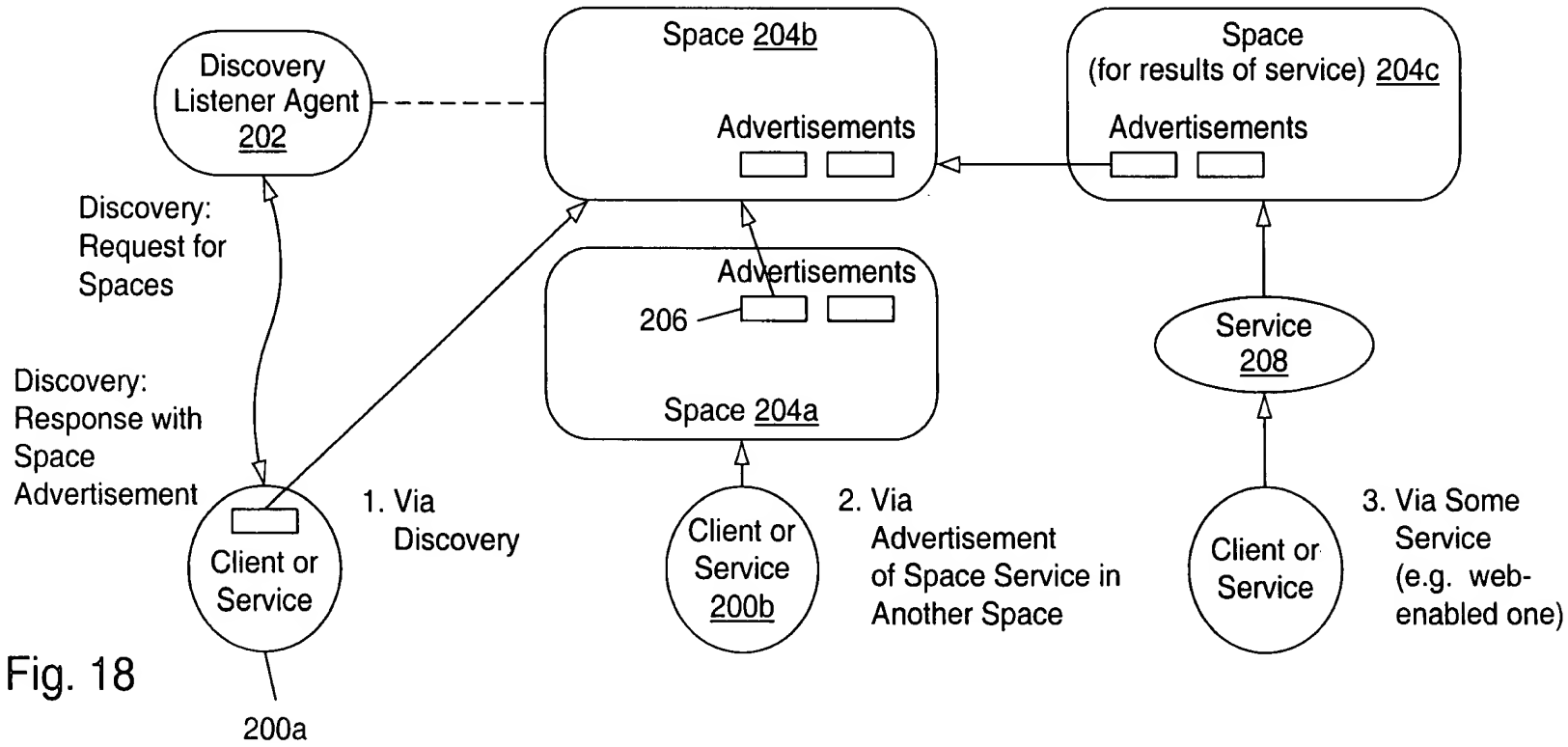


Fig. 18

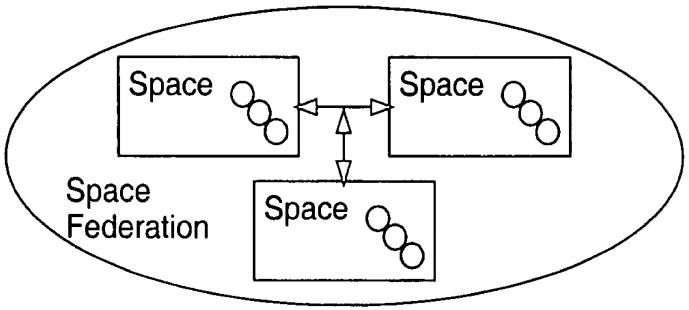


Fig. 19

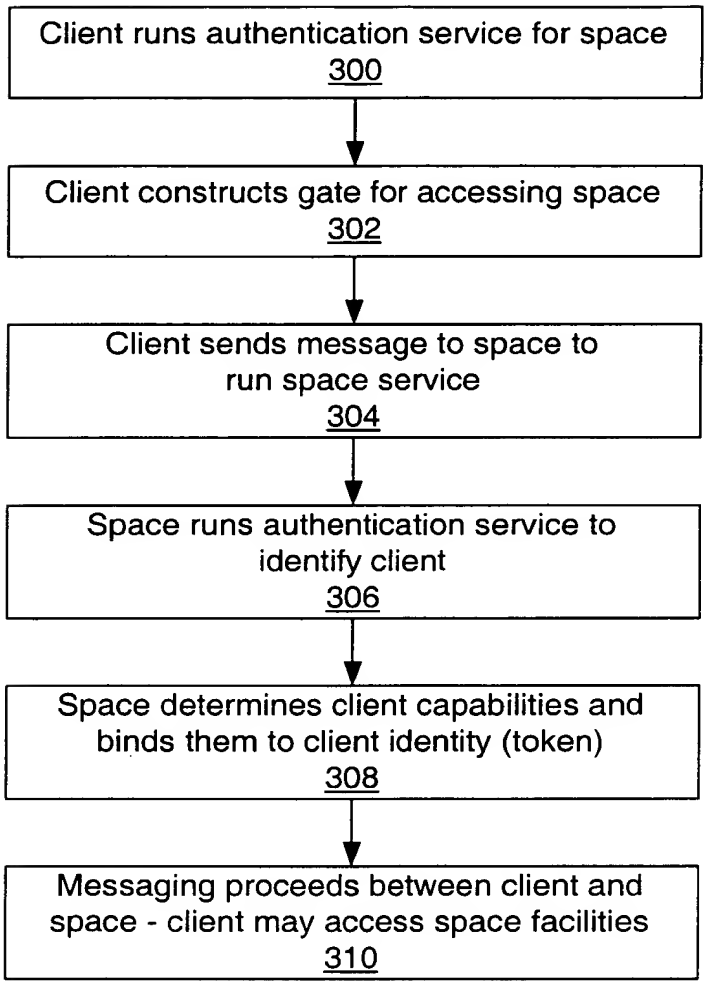

Client runs authentication service for space
300
Client constructs gate for accessing space
302
Client sends message to space to run space service
304
Space runs authentication service to identify client
306
Space determines client capabilities and binds them to client identity (token)
308
Messaging proceeds between client and space - client may access space facilities
310

Fig. 20

0060T0T- T2EE6960

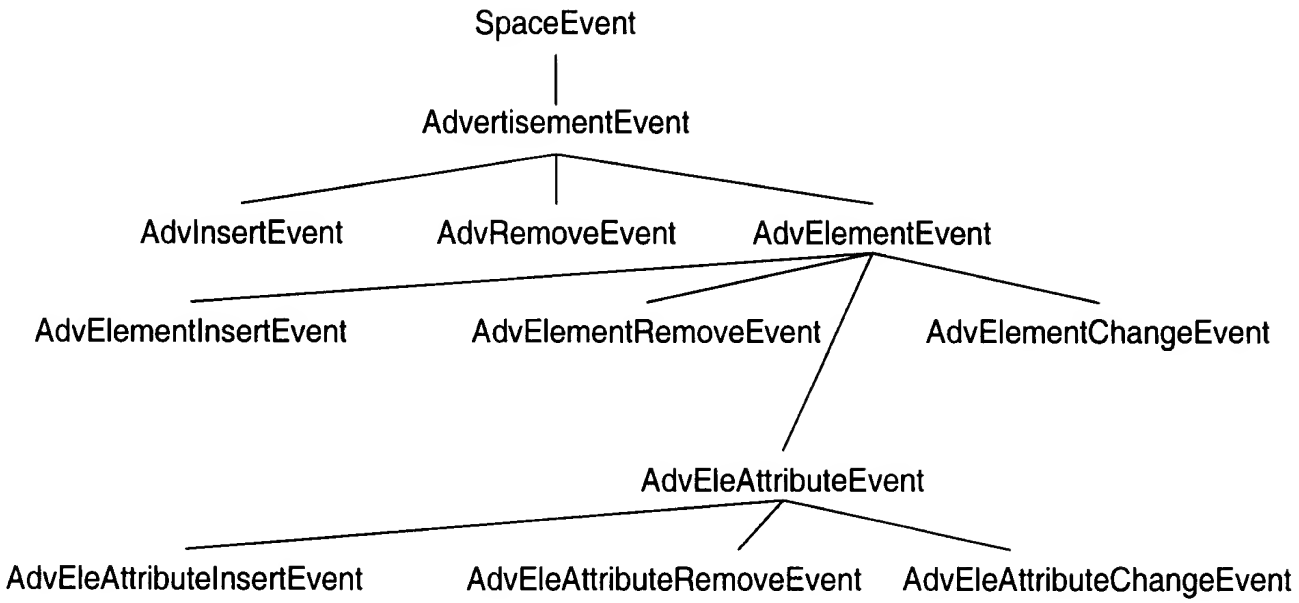


Fig. 21

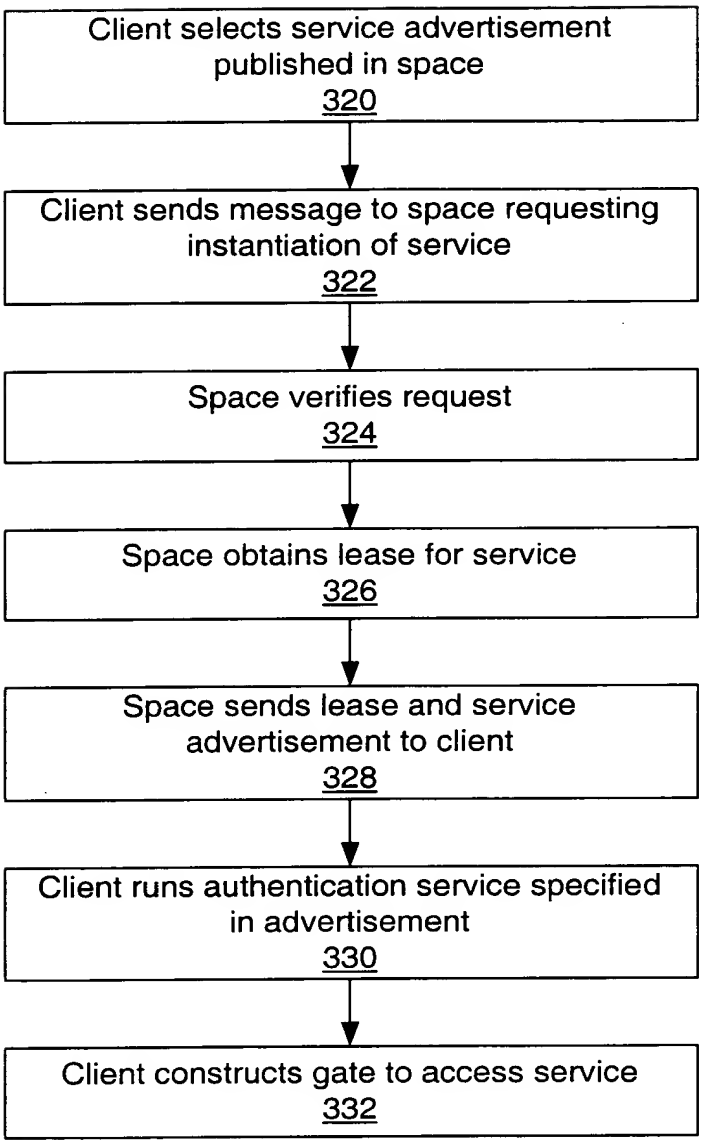

Client selects service advertisement published in space
320
Client sends message to space requesting instantiation of service
322
Space verifies request
324
Space obtains lease for service
326
Space sends lease and service advertisement to client
328
Client runs authentication service specified in advertisement
330
Client constructs gate to access service
332

Fig. 22

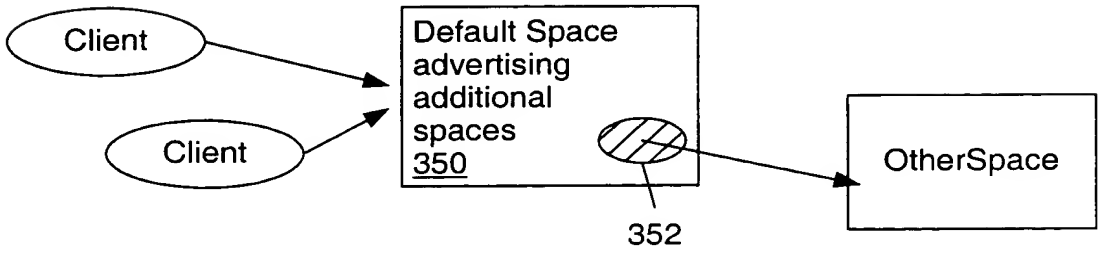

Client
Client
Default Space advertising additional spaces
350
352
OtherSpace

Fig. 23

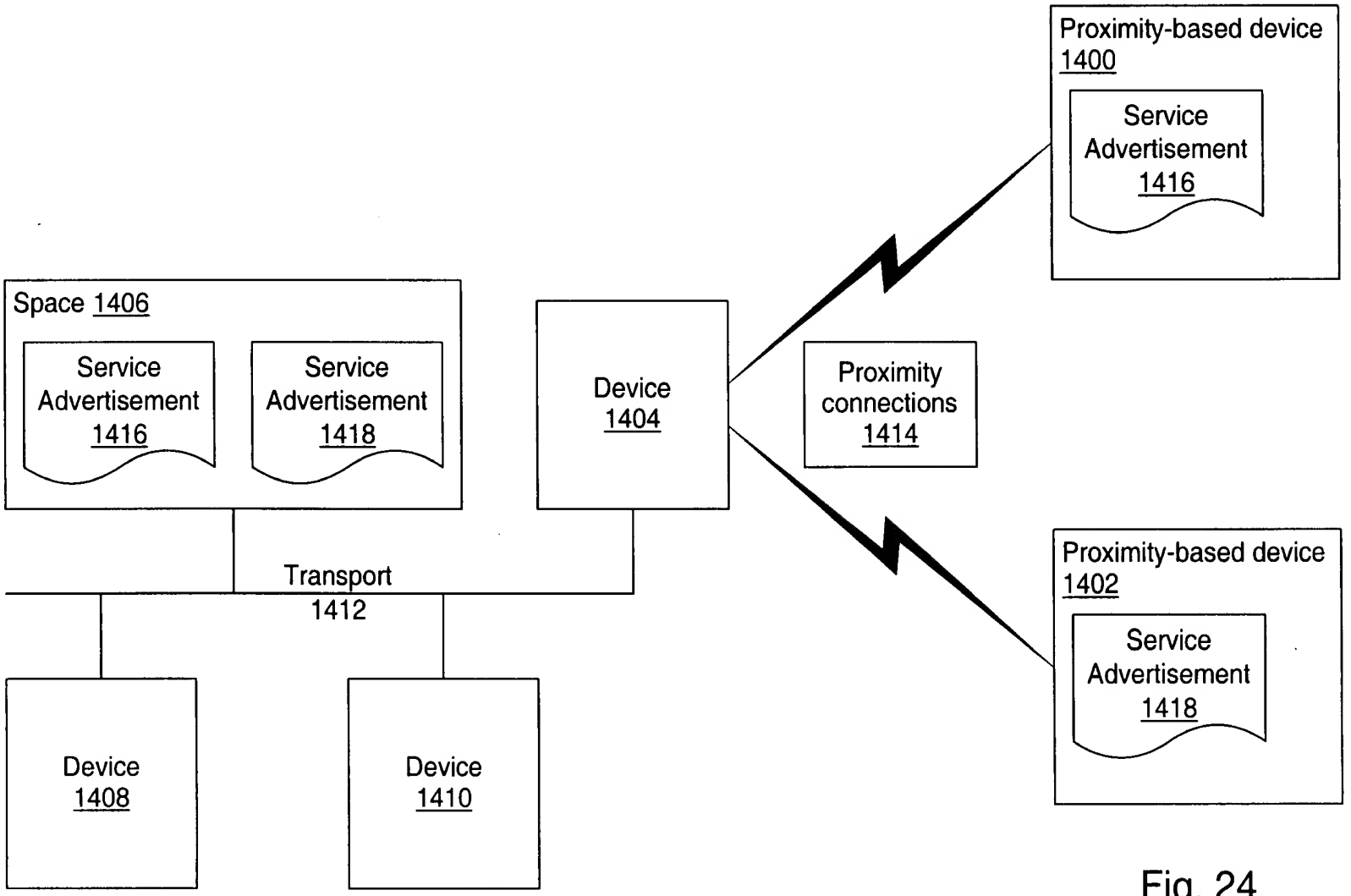

Proximity-based device
1400
Service
Advertisement
1416
Space 1406
Service
Advertisement
1416
Service
Advertisement
1418
Device
1404
Proximity
connections
1414
Transport
1412
Proximity-based device
1402
Service
Advertisement
1418
Device
1408
Device
1410

Fig. 24

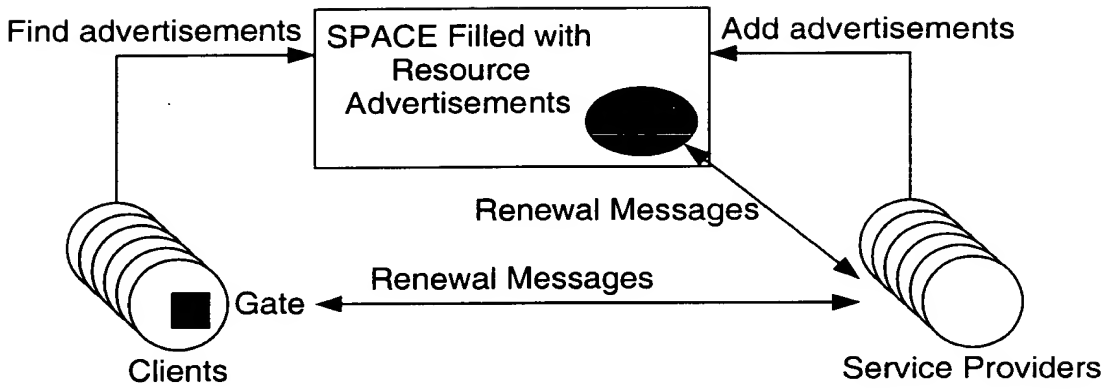


Fig. 25

0060704 = 1253.00

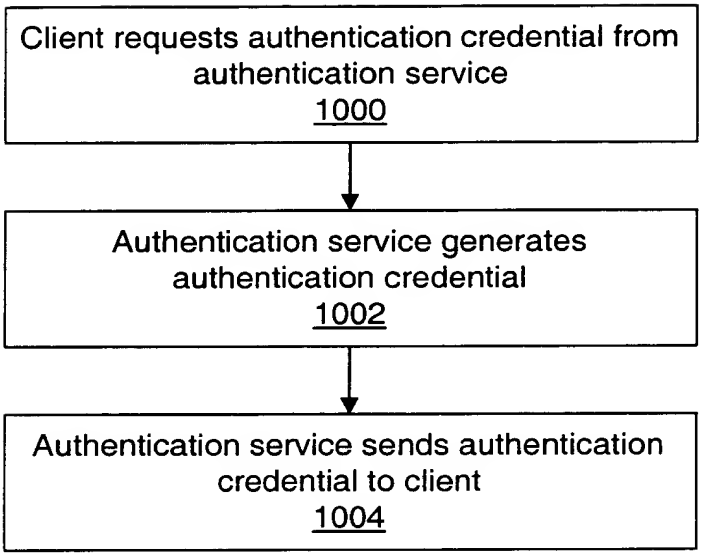


FIG. 26a

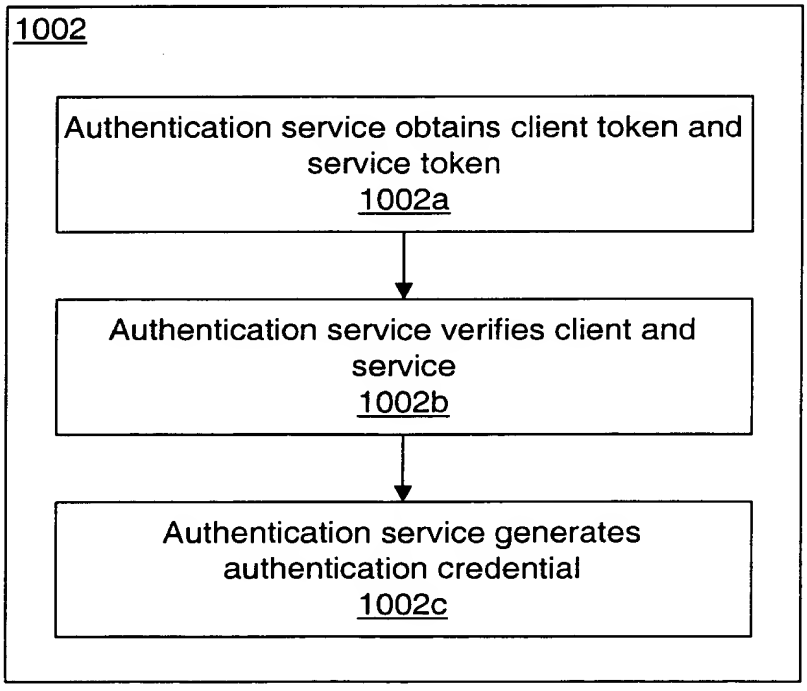


FIG. 26b

D06T0T T2EE6960

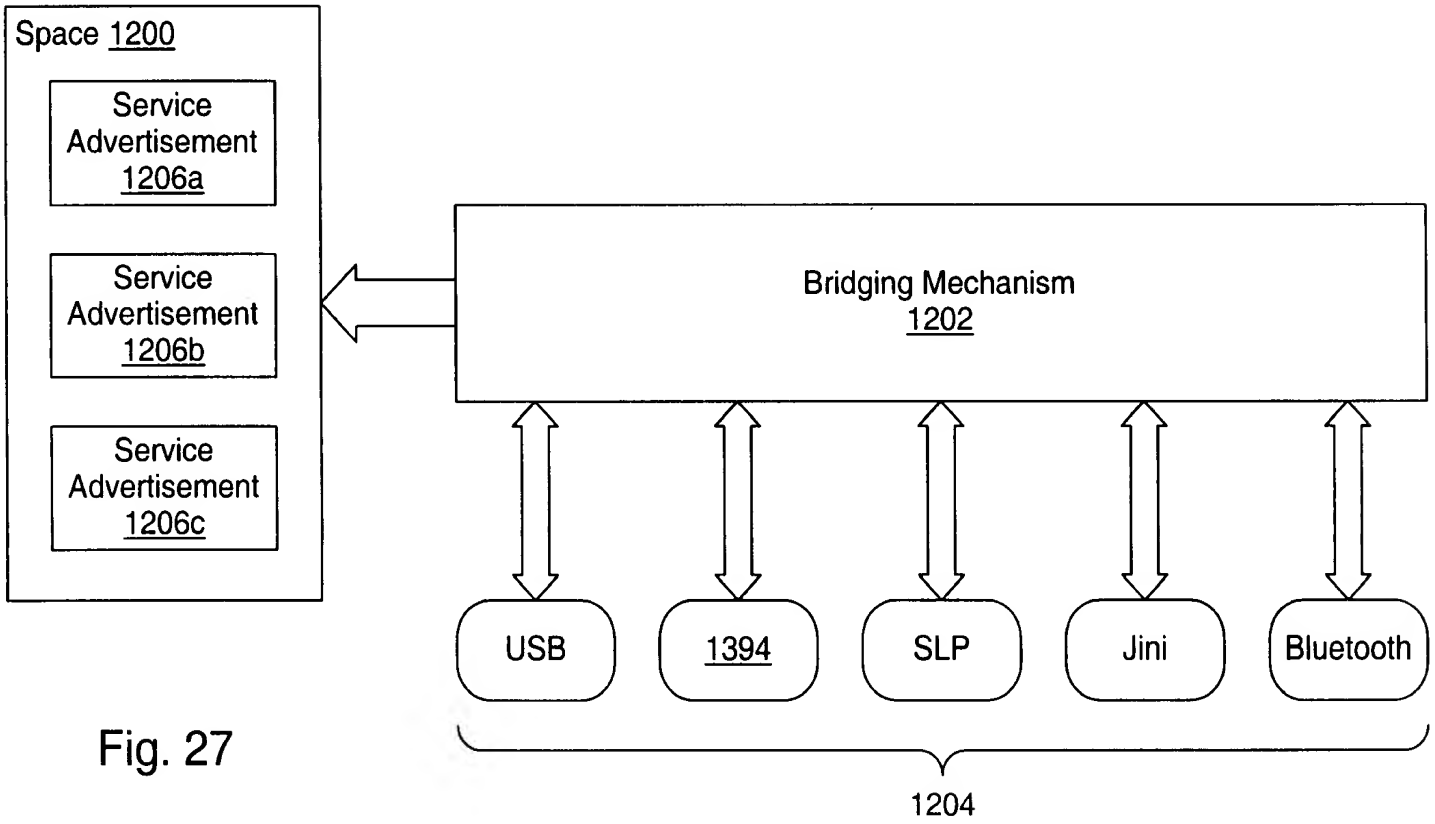


Fig. 27

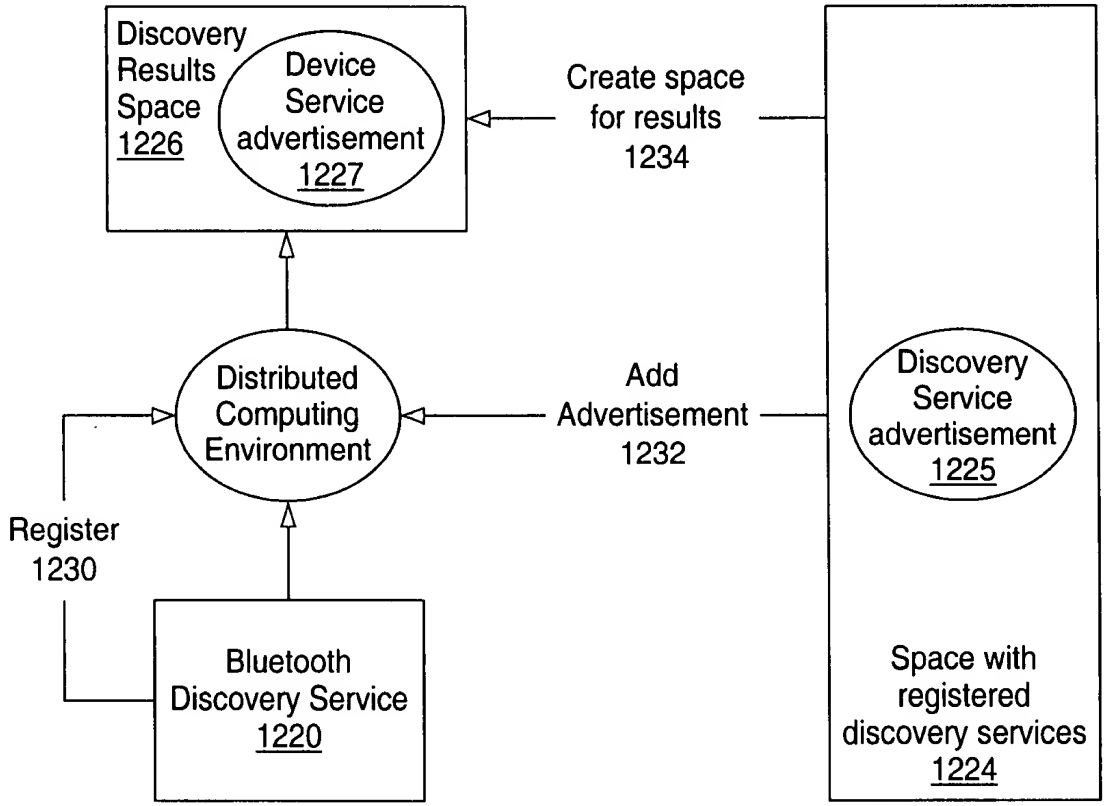
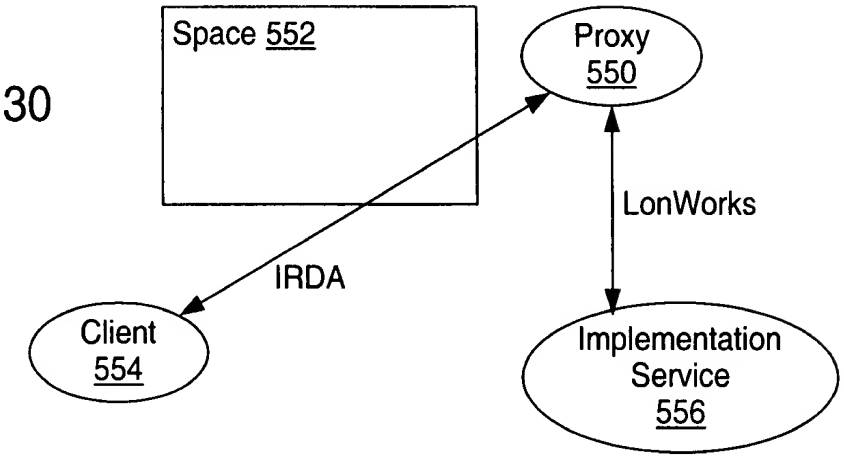

Discovery Results Space 1226
Device Service advertisement 1227
Create space for results 1234
Distributed Computing Environment
Add Advertisement 1232
Discovery Service advertisement 1225
Register 1230
Bluetooth Discovery Service 1220
Space with registered discovery services 1224

Fig. 28

006701 T2E6960

Fig. 30



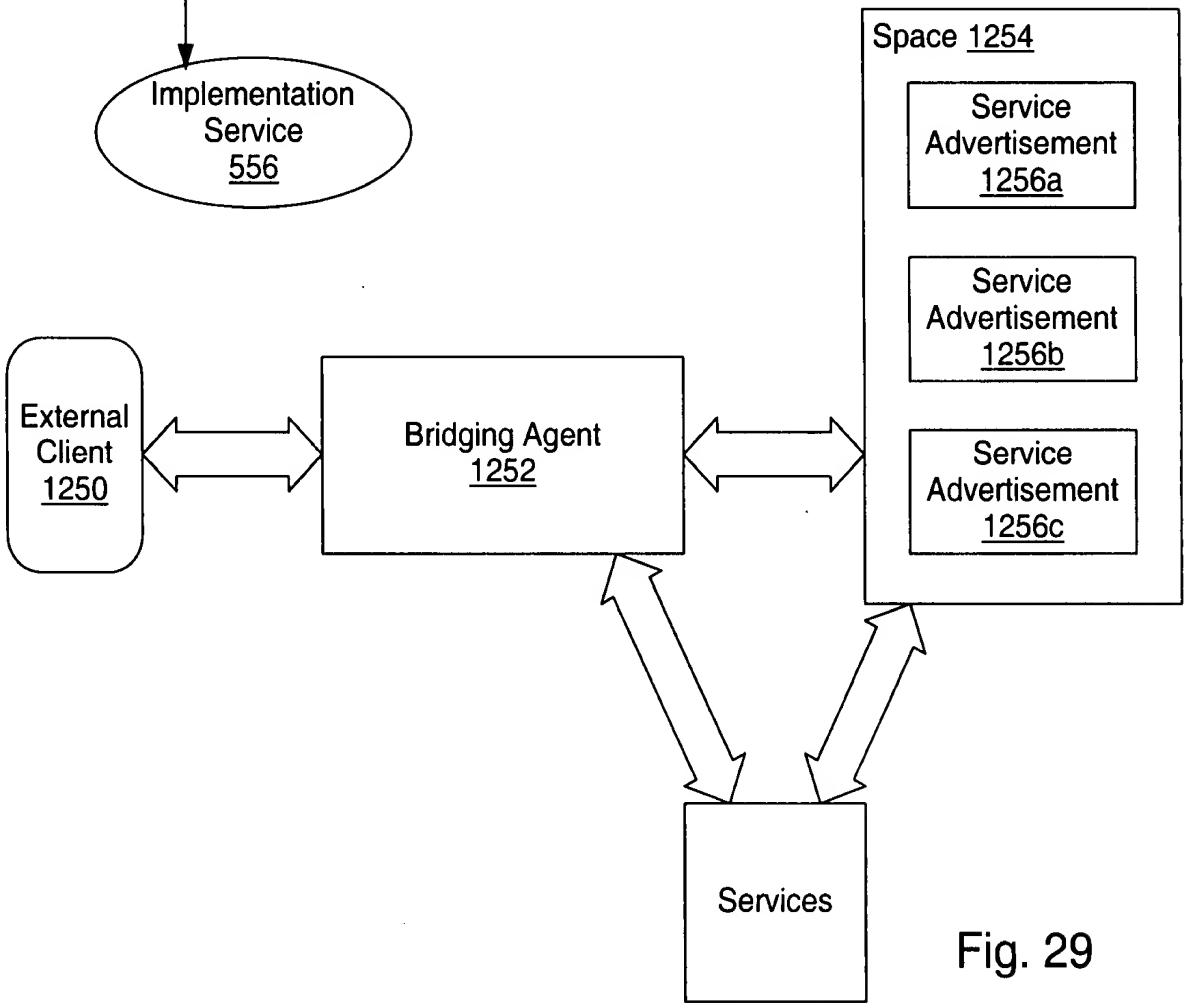


Fig. 29

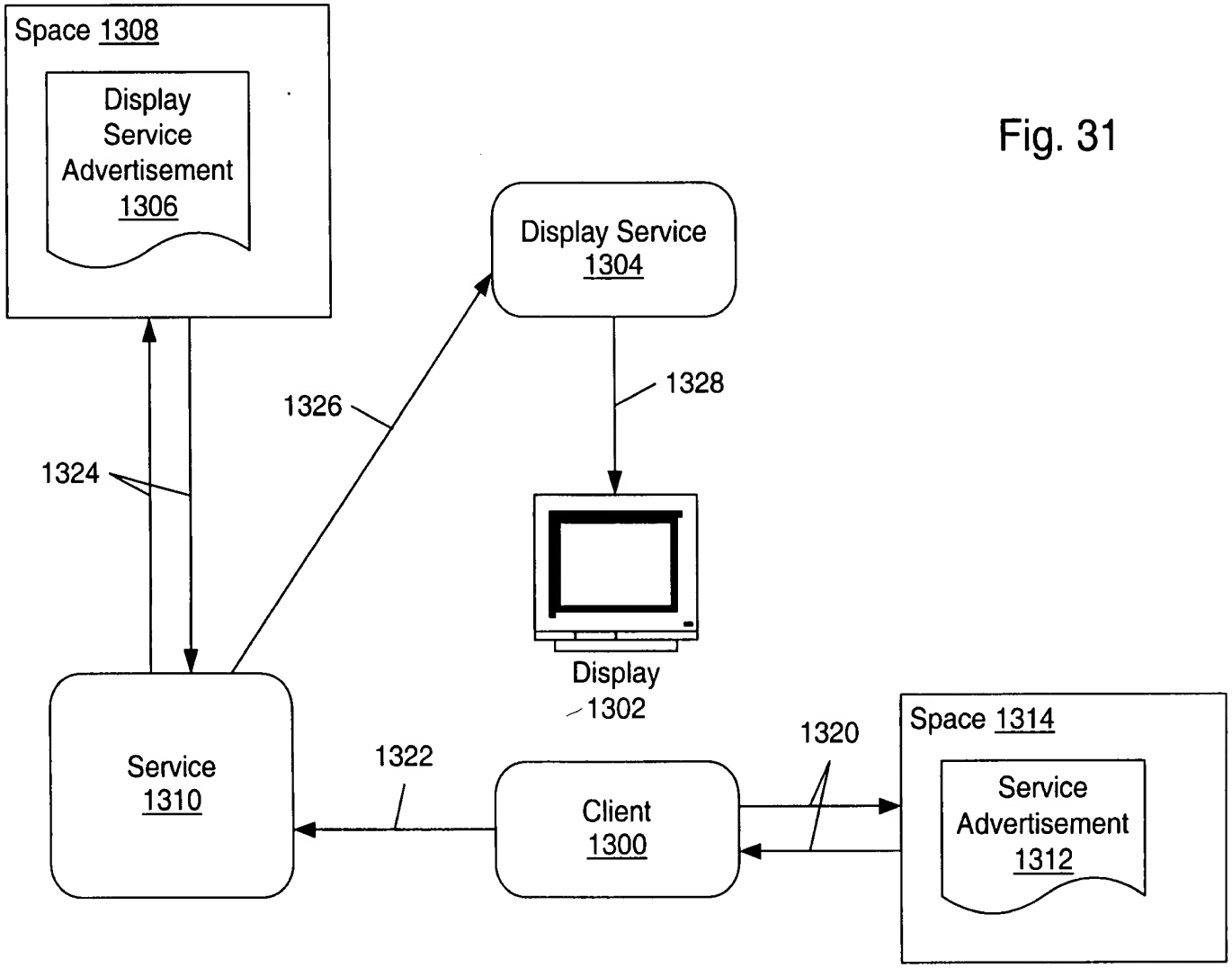

Space 1308
Display Service Advertisement 1306
Display Service 1304
1326
1328
1324
Display 1302
Service 1310
1322
Client 1300
1320
Space 1314
Service Advertisement 1312

Fig. 31

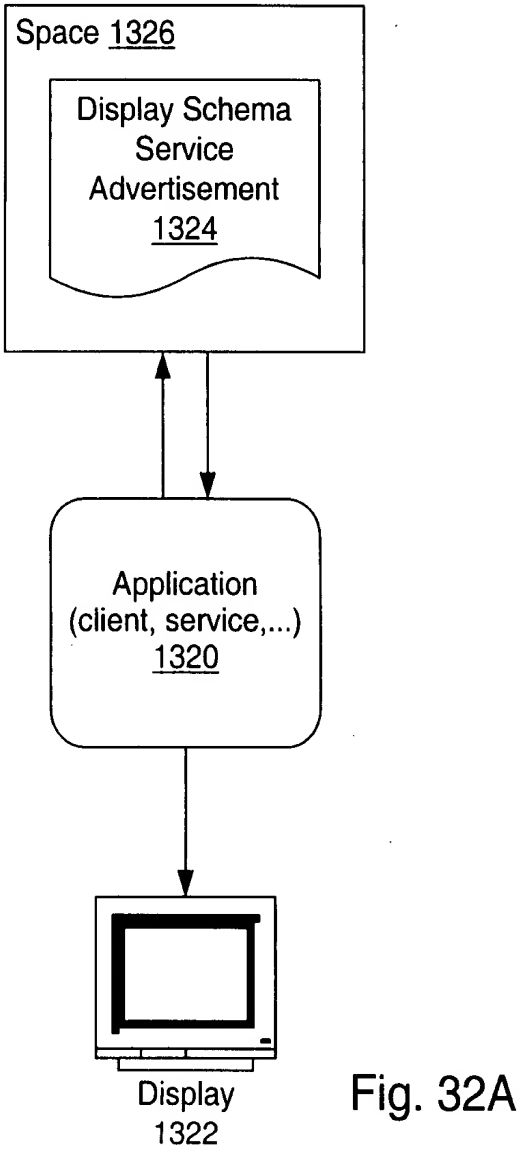


Fig. 32A

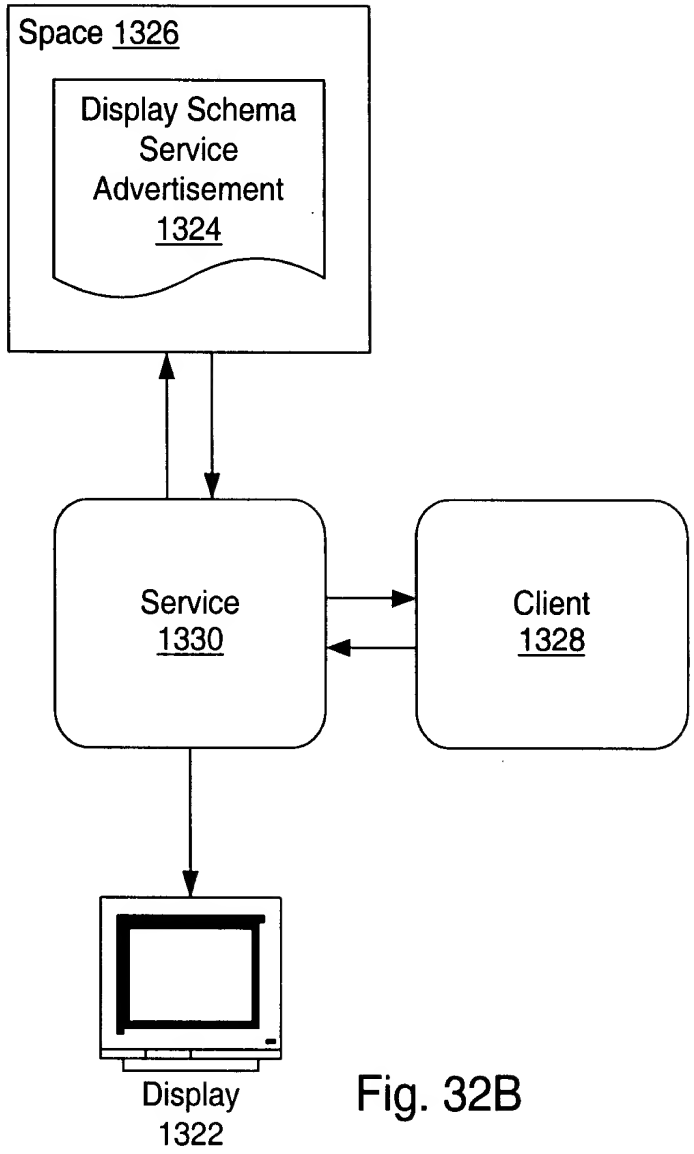


Fig. 32B

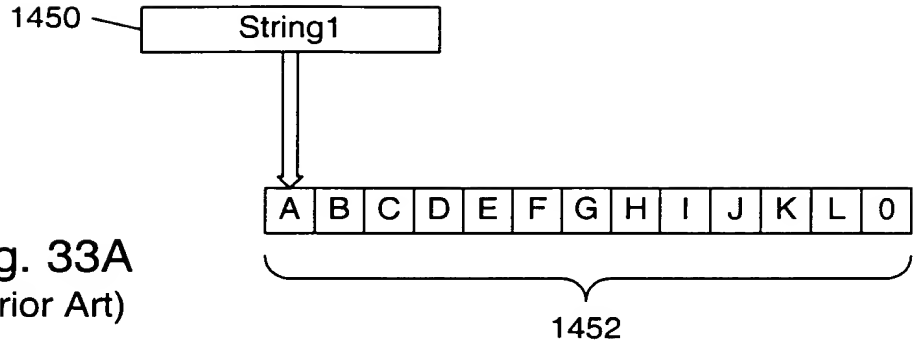


Fig. 33A
(Prior Art)

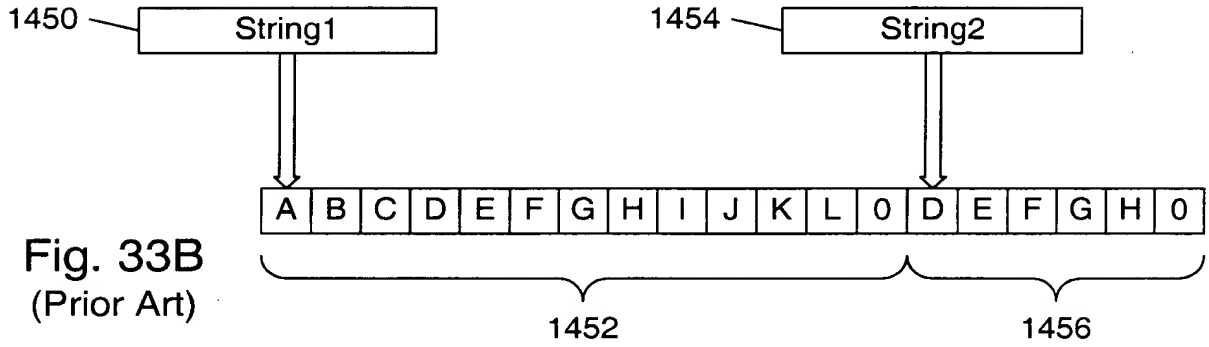


Fig. 33B
(Prior Art)

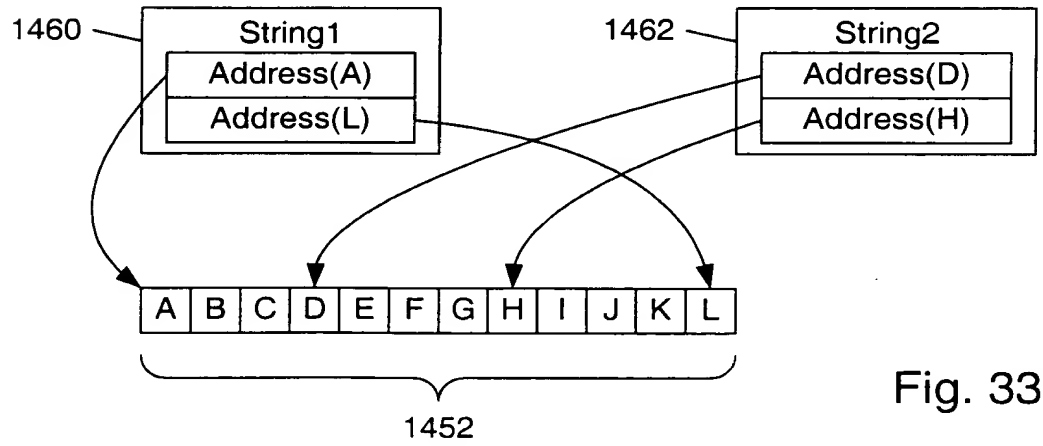


Fig. 33C

DO6TOT T2EE6960

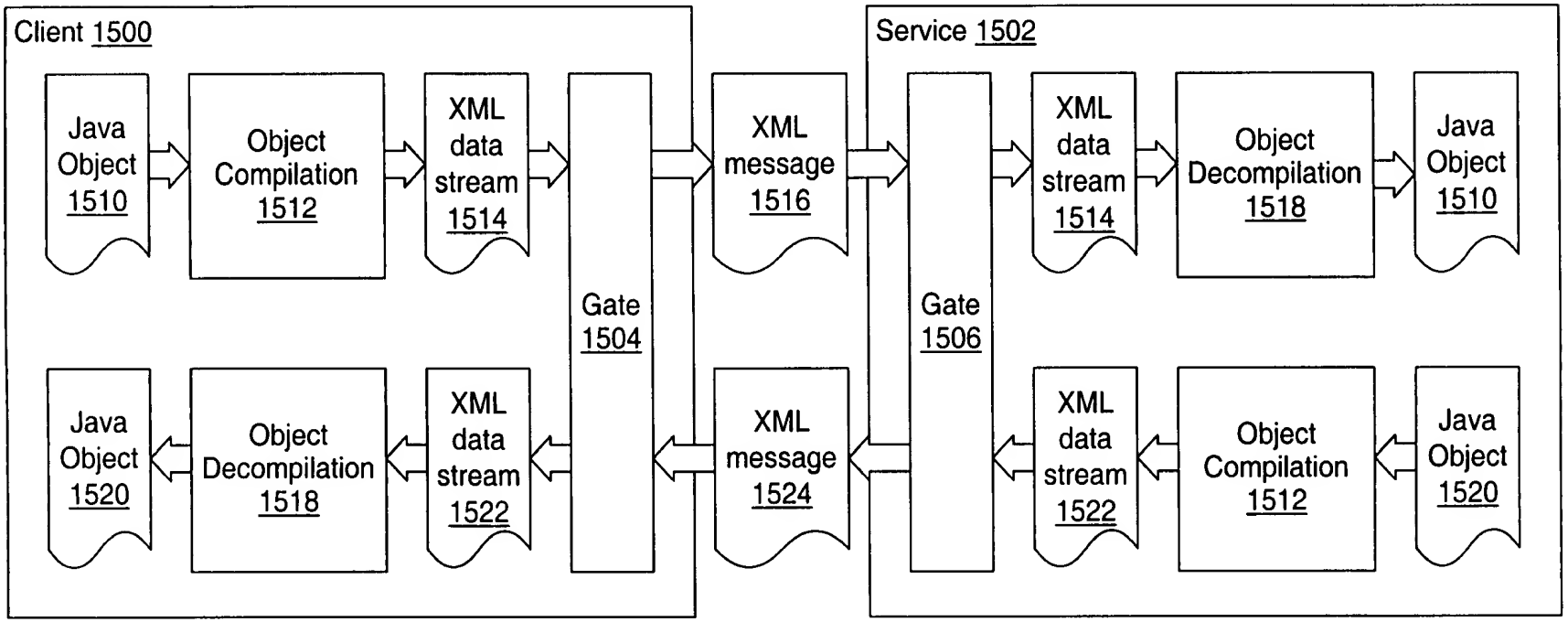


Fig. 34

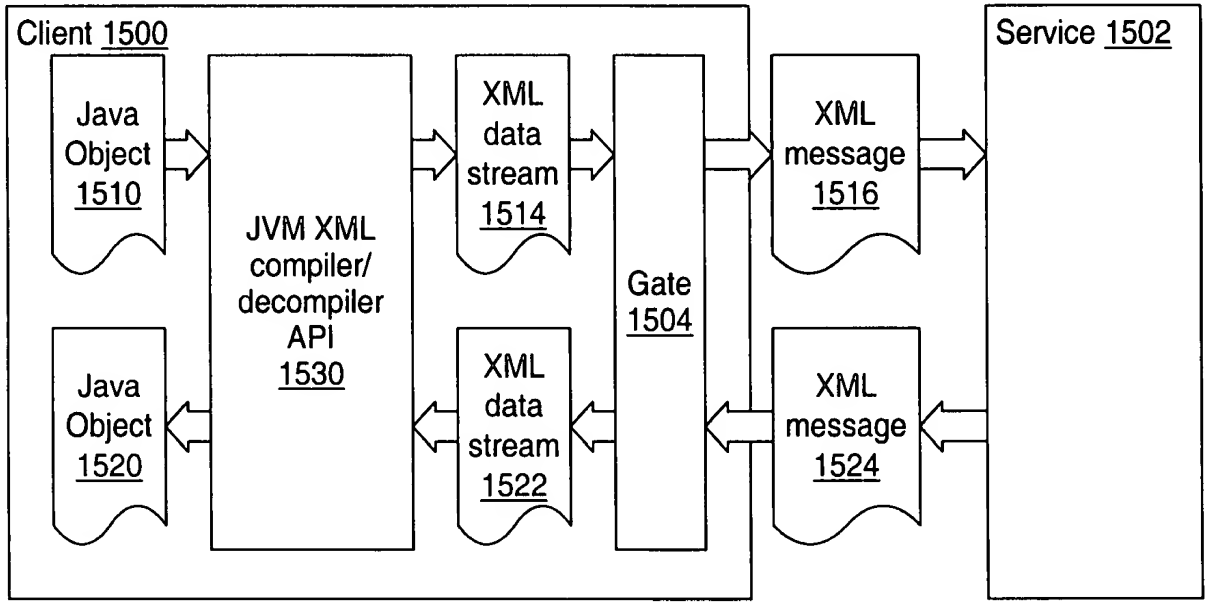


Fig. 35a

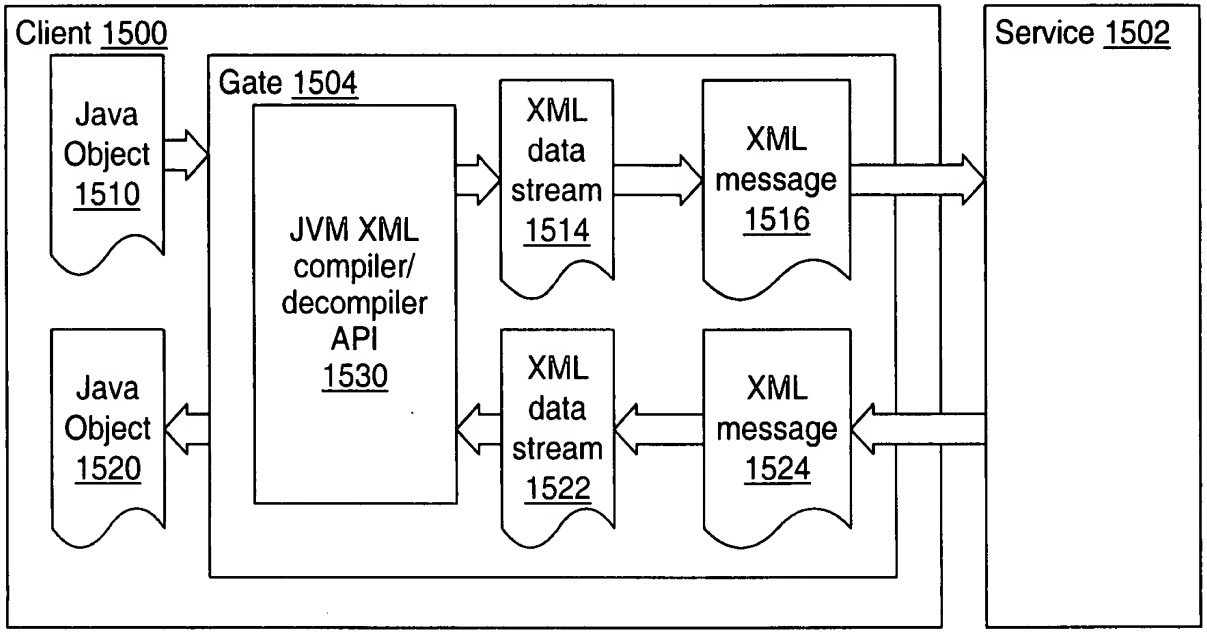


Fig. 35b

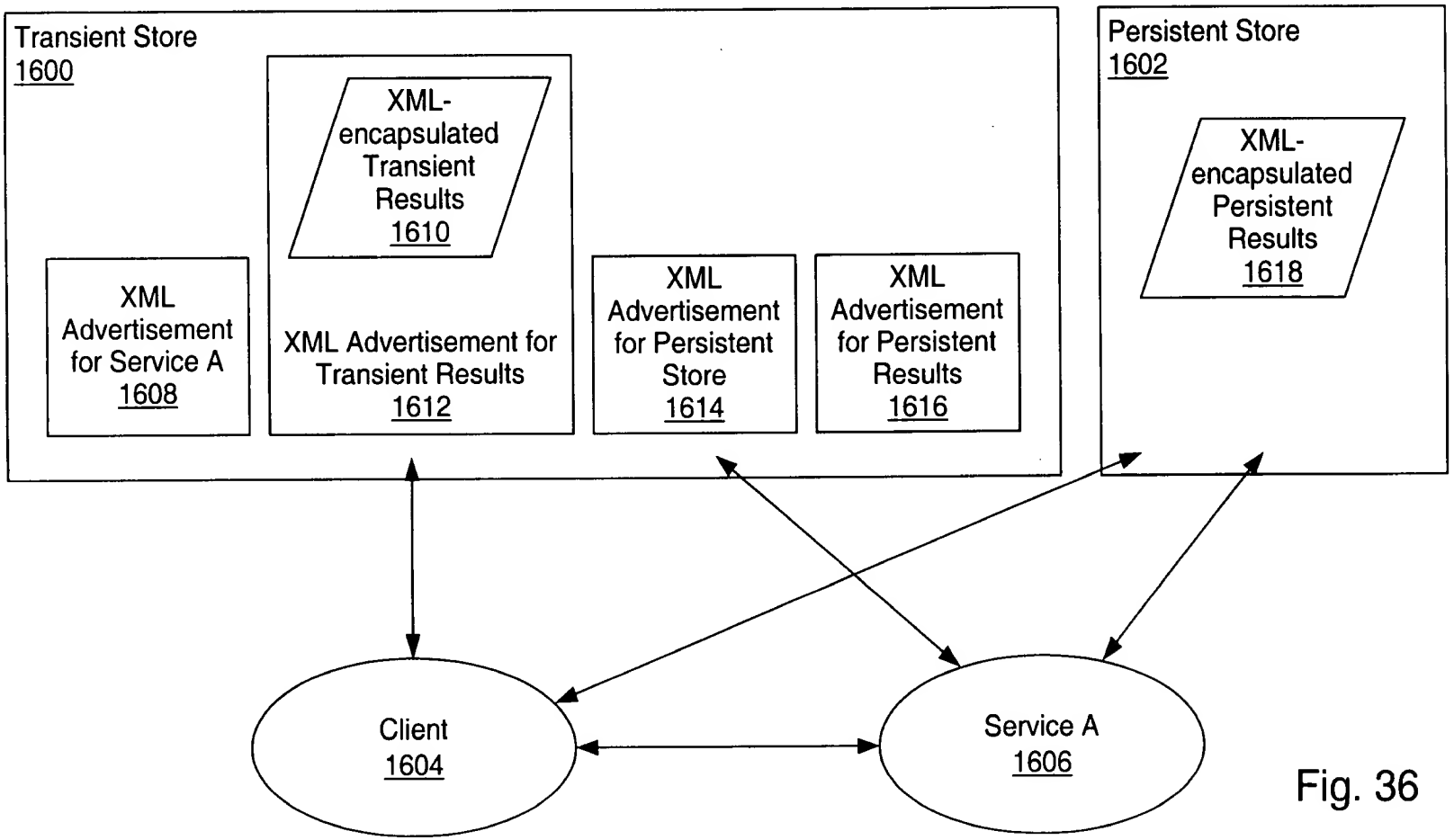

Transient Store
1600
XML-encapsulated Transient Results
1610
XML Advertisement for Service A
1608
XML Advertisement for Transient Results
1612
XML Advertisement for Persistent Store
1614
XML Advertisement for Persistent Results
1616
Persistent Store
1602
XML-encapsulated Persistent Results
1618
Client
1604
Service A
1606

Fig. 36

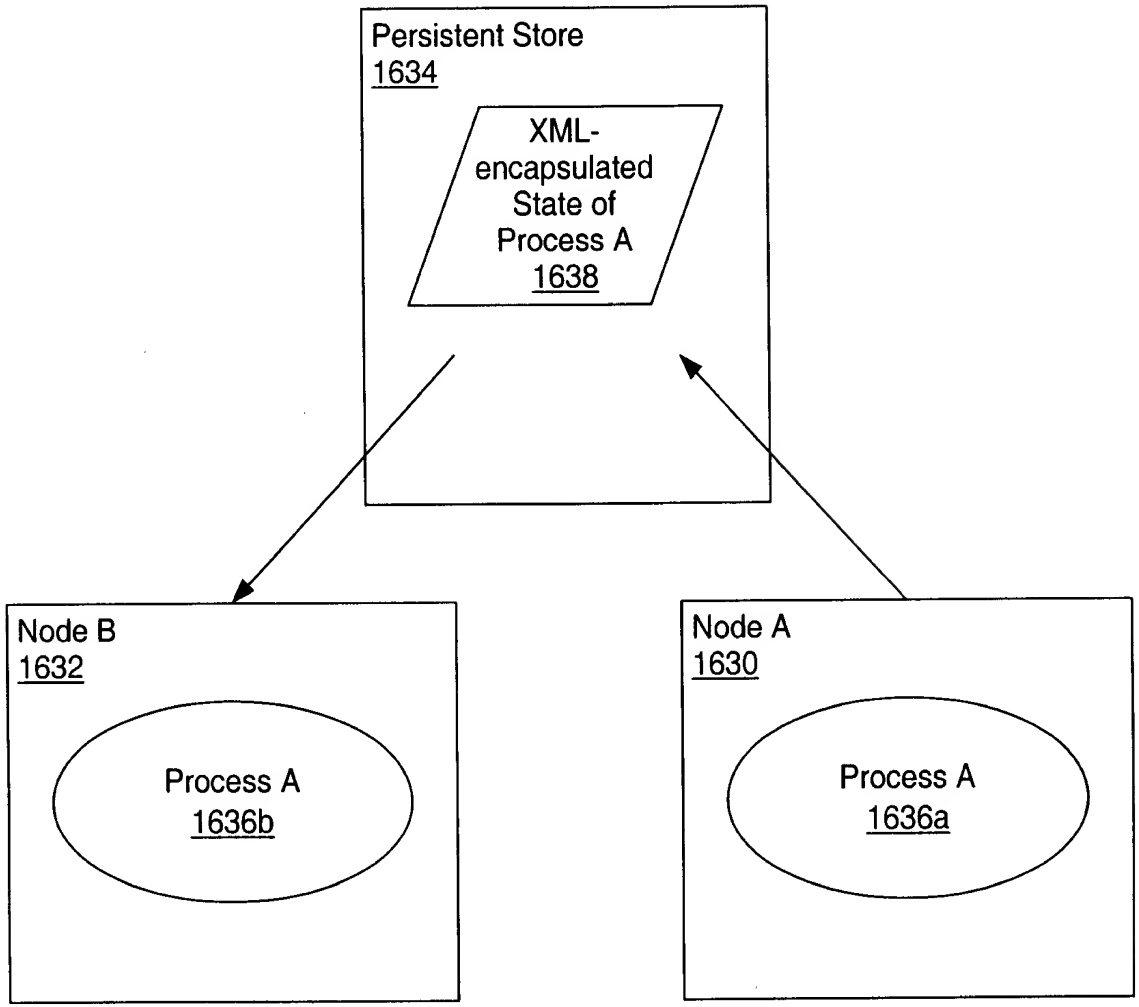

Persistent Store
1634
XML-encapsulated State of Process A
1638
Node B
1632
Process A
1636b
Node A
1630
Process A
1636a

Fig. 37

006707 "T2E26960

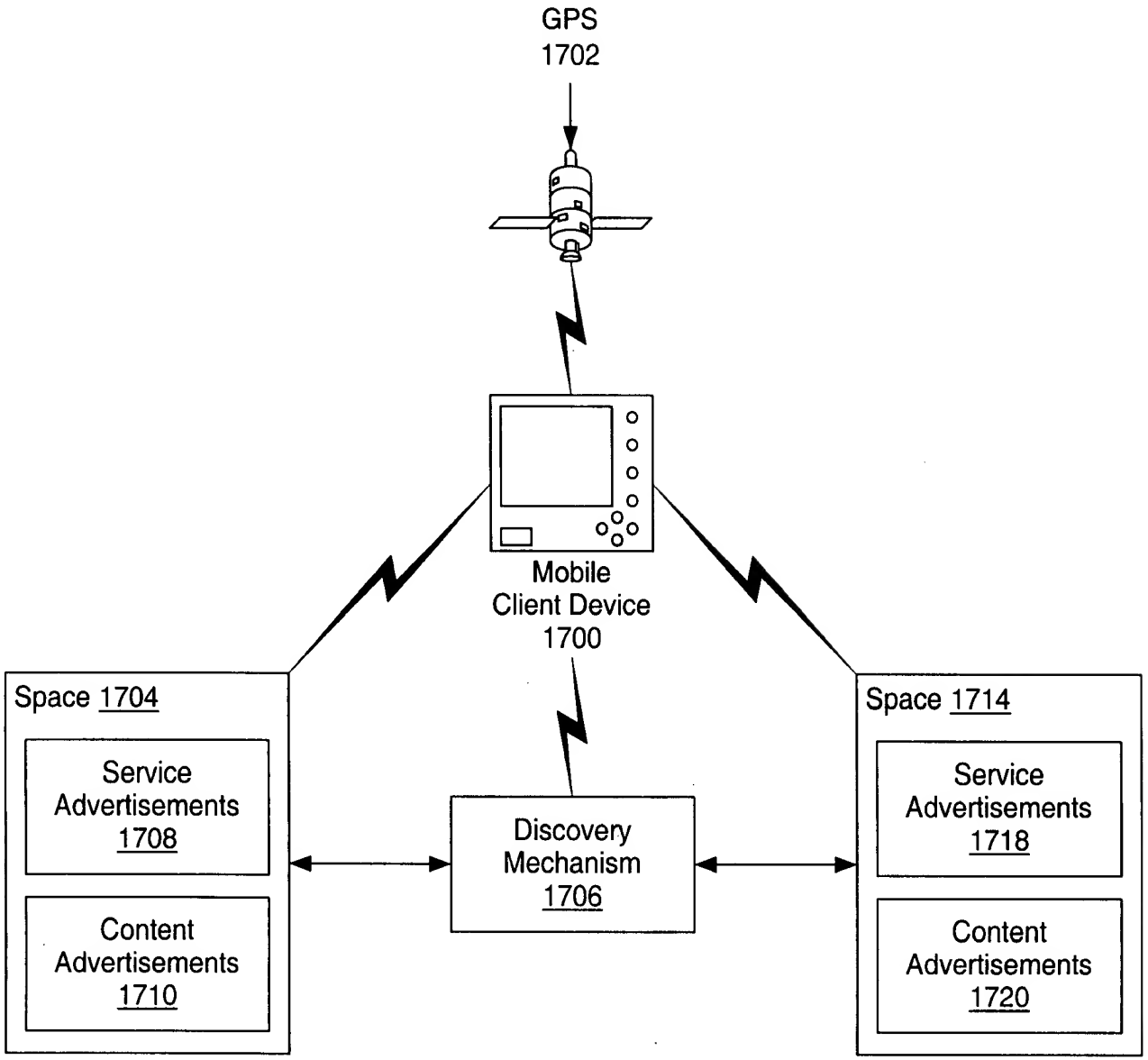


Fig. 38

006707 "T2EE6960

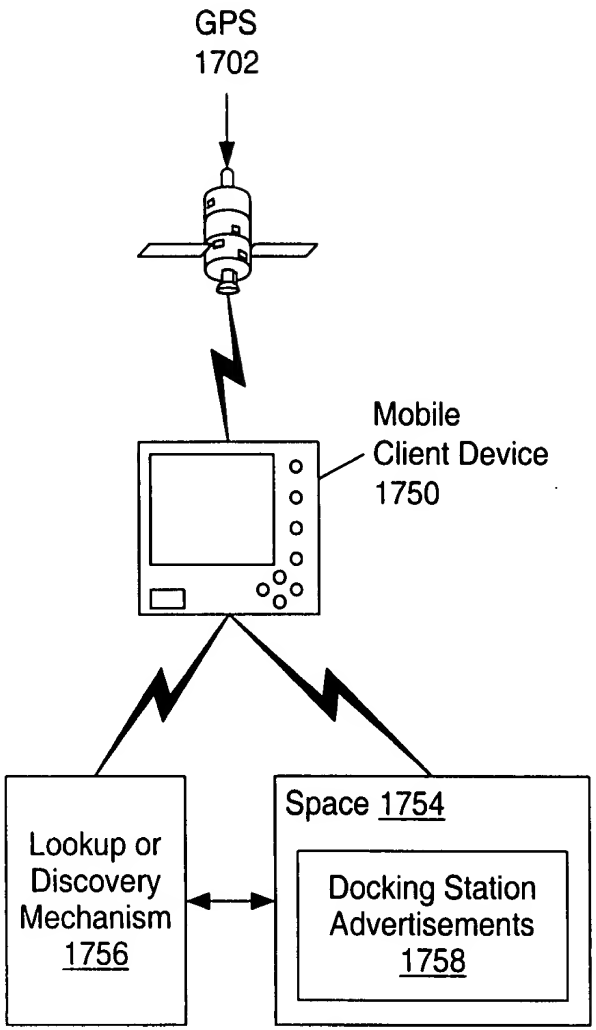


Fig. 39a

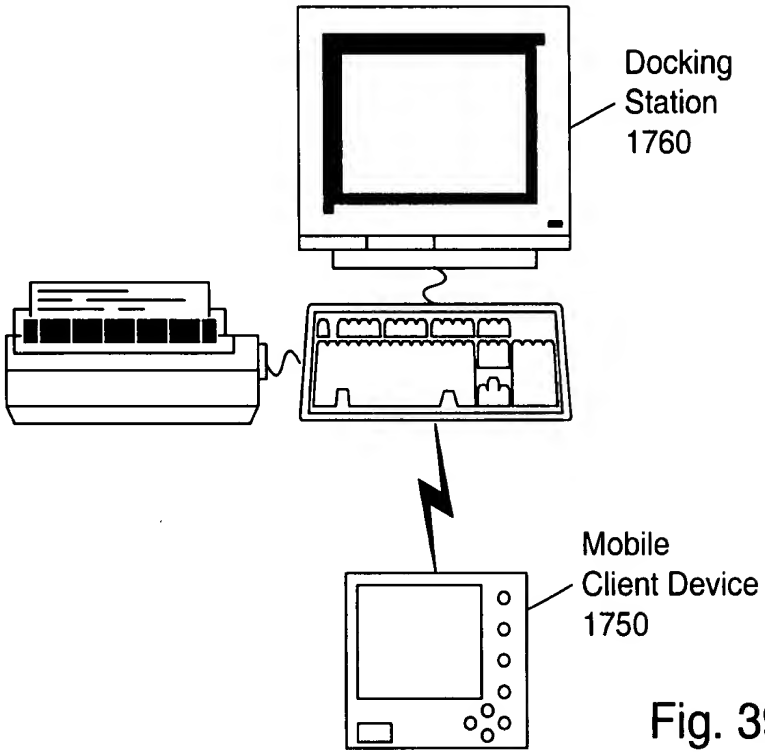


Fig. 39b

DOCKET: 12266960

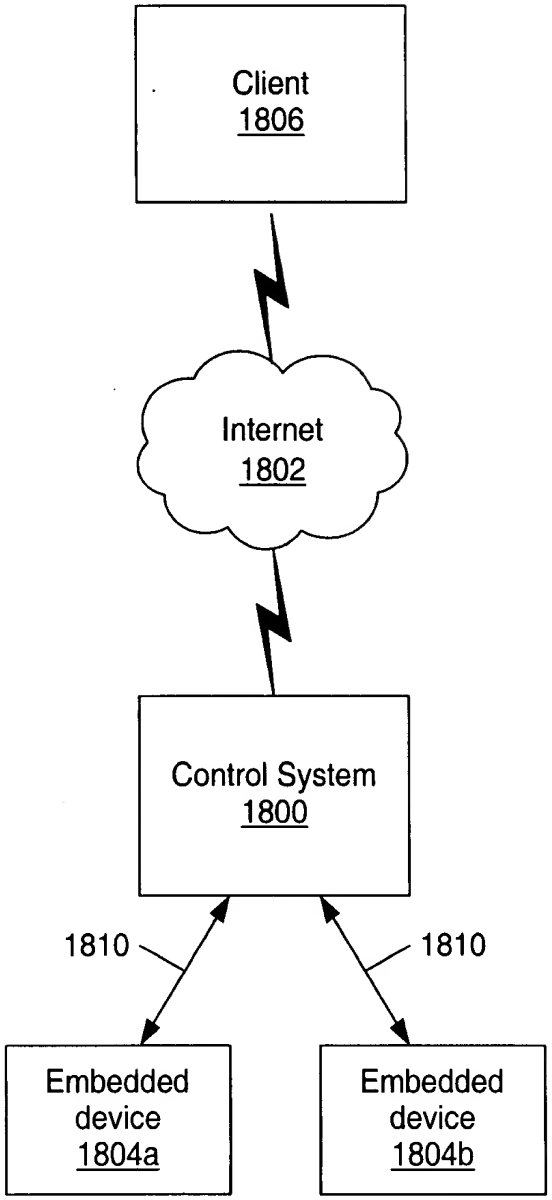


Fig. 40a

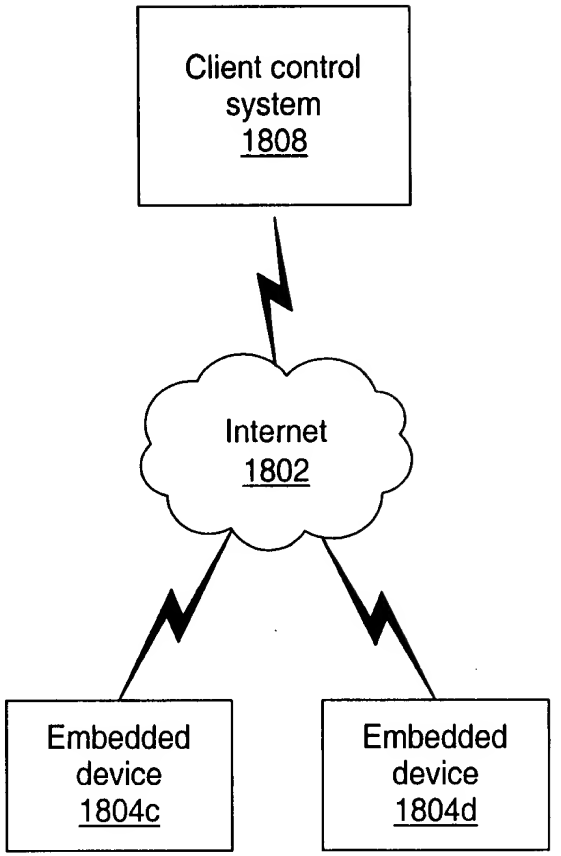


Fig. 40b

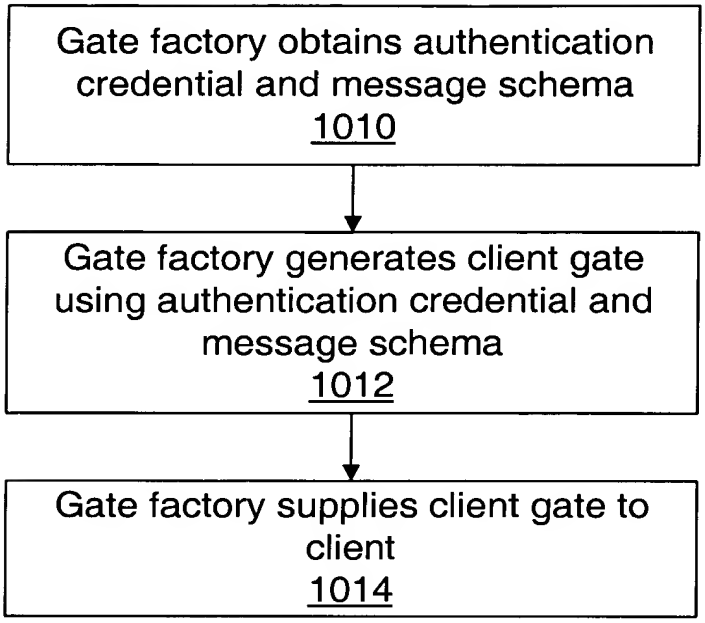

Gate factory obtains authentication credential and message schema
1010
Gate factory generates client gate using authentication credential and message schema
1012
Gate factory supplies client gate to client
1014

FIG. 41

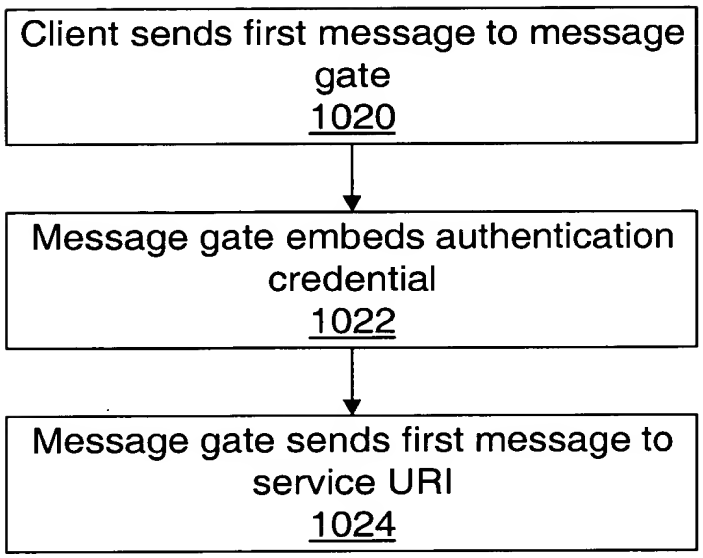


FIG. 42a

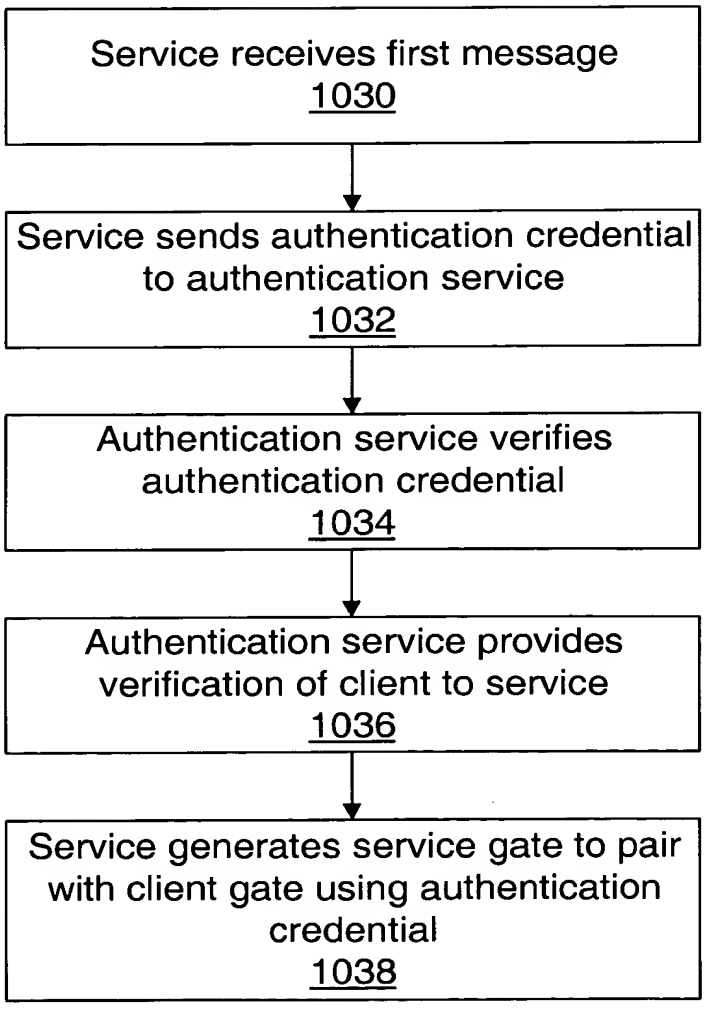


FIG. 42b

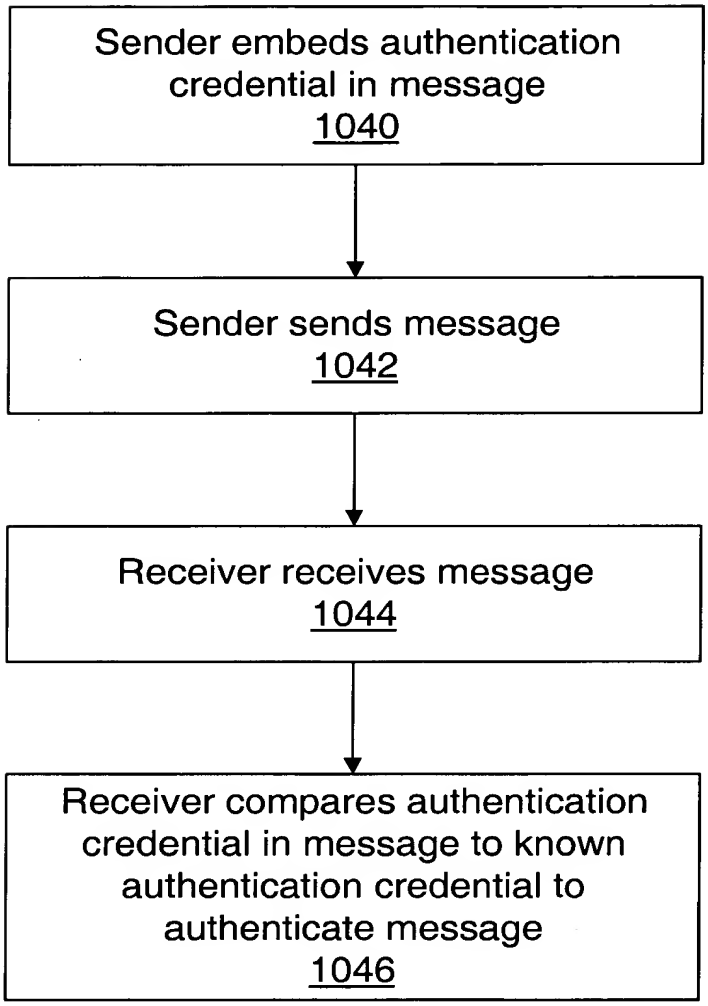

Sender embeds authentication credential in message
1040
Sender sends message
1042
Receiver receives message
1044
Receiver compares authentication credential in message to known authentication credential to authenticate message
1046

FIG. 42c

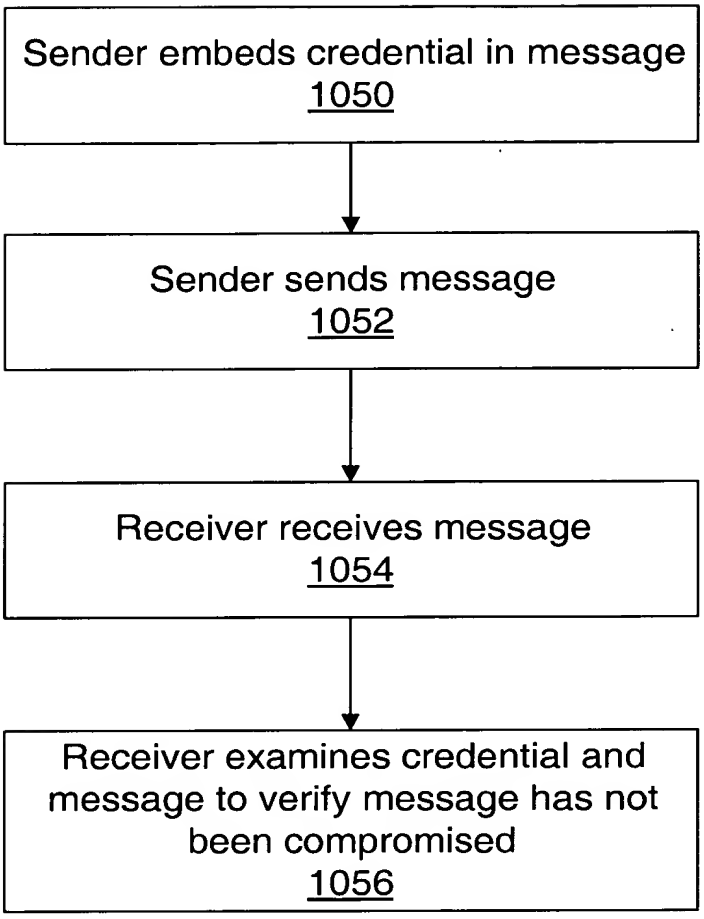

Sender embeds credential in message
1050
Sender sends message
1052
Receiver receives message
1054
Receiver examines credential and message to verify message has not been compromised
1056

FIG. 43

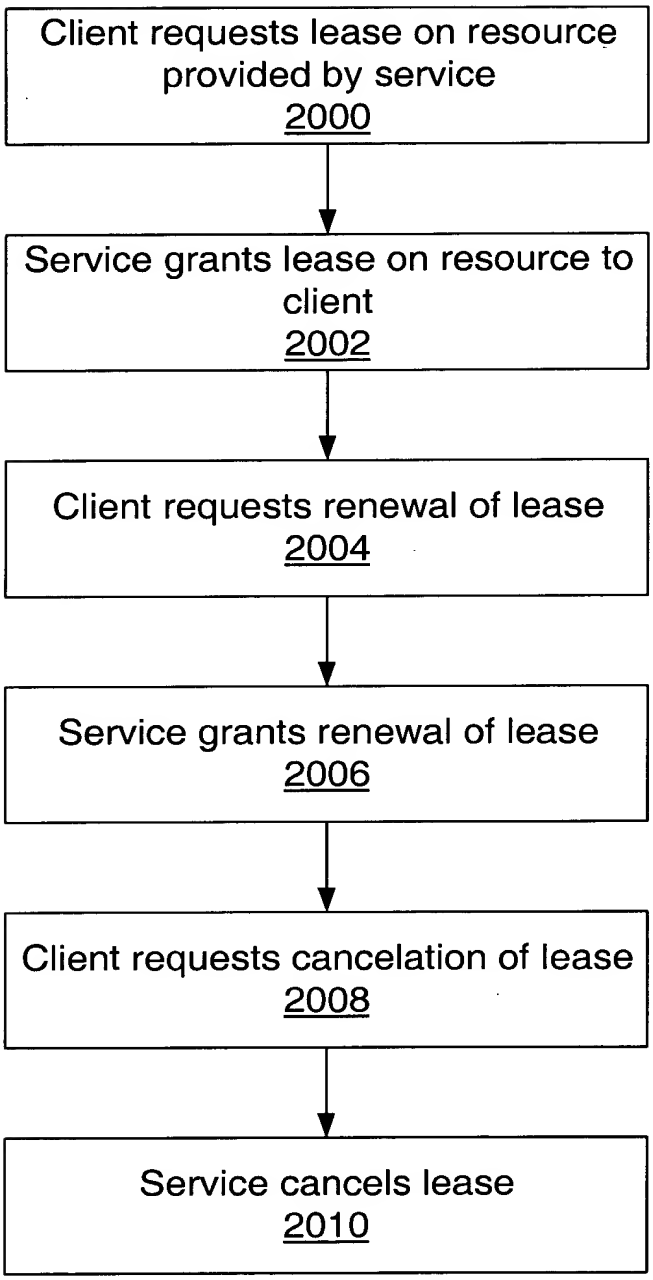

Client requests lease on resource provided by service
2000
Service grants lease on resource to client
2002
Client requests renewal of lease
2004
Service grants renewal of lease
2006
Client requests cancelation of lease
2008
Service cancels lease
2010

FIG. 44

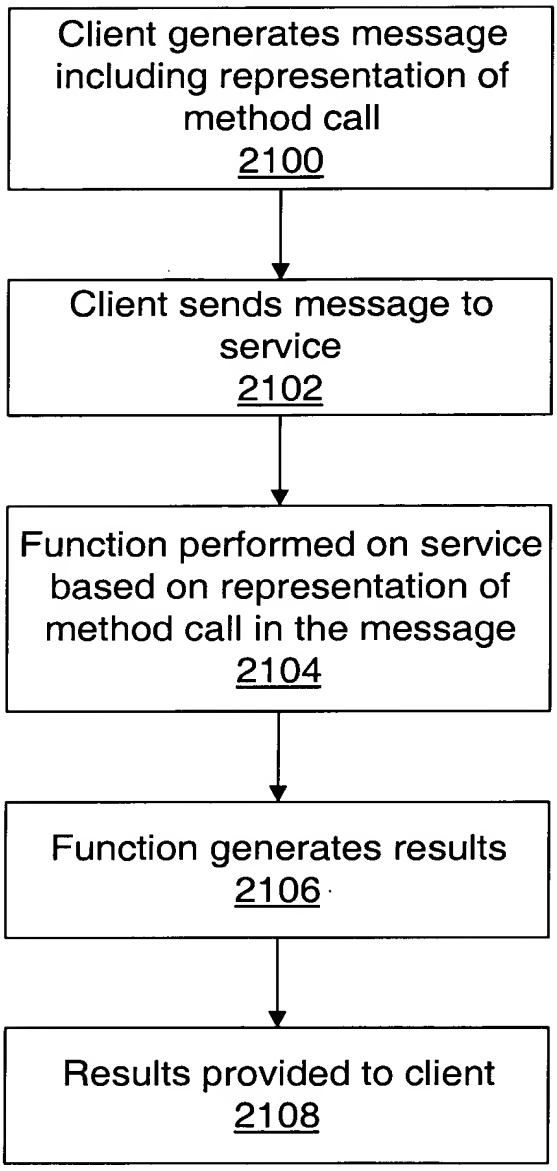

Client generates message including representation of method call
2100
Client sends message to service
2102
Function performed on service based on representation of method call in the message
2104
Function generates results
2106
Results provided to client
2108

Figure 45a

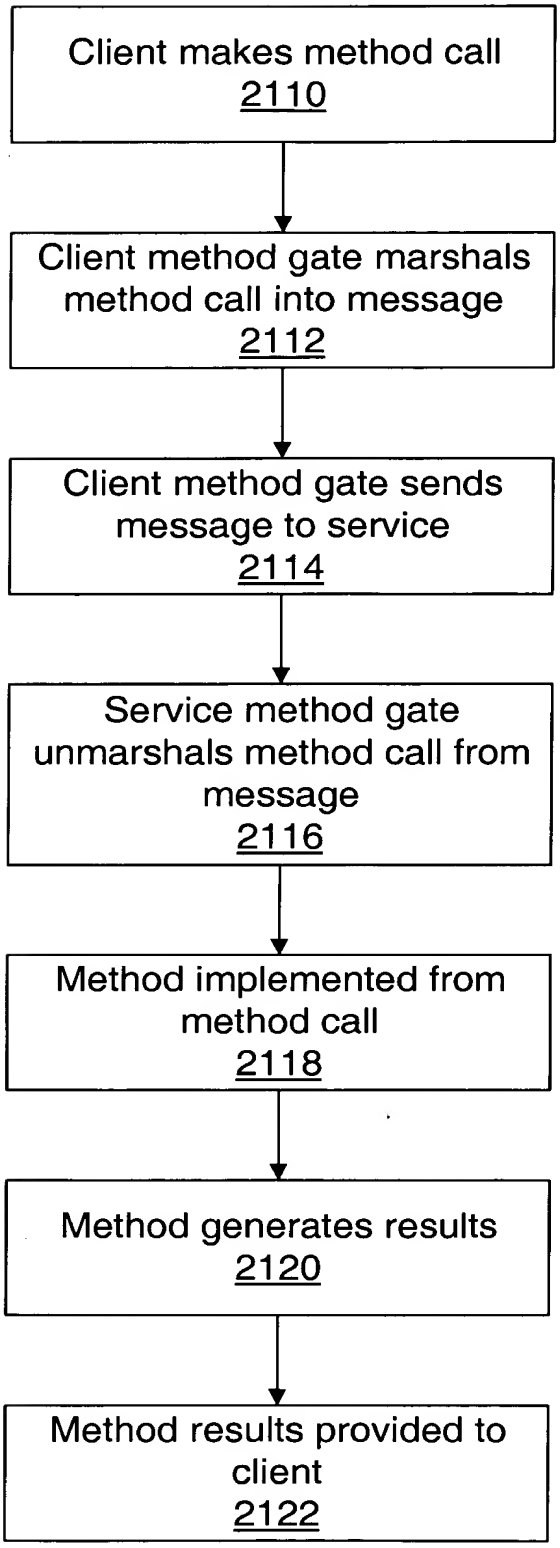


Figure 45b

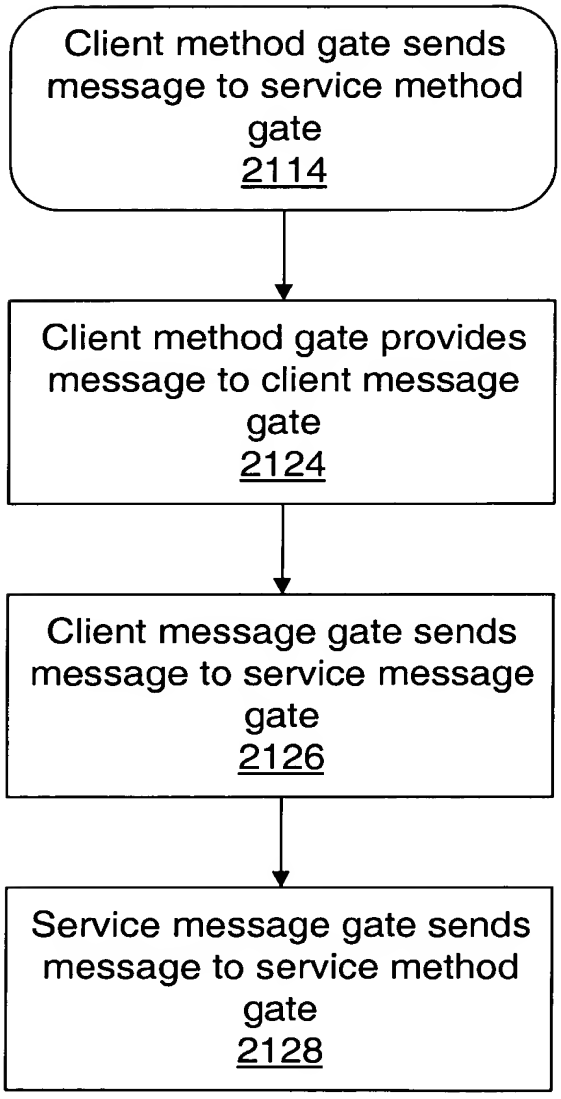


Figure 45c

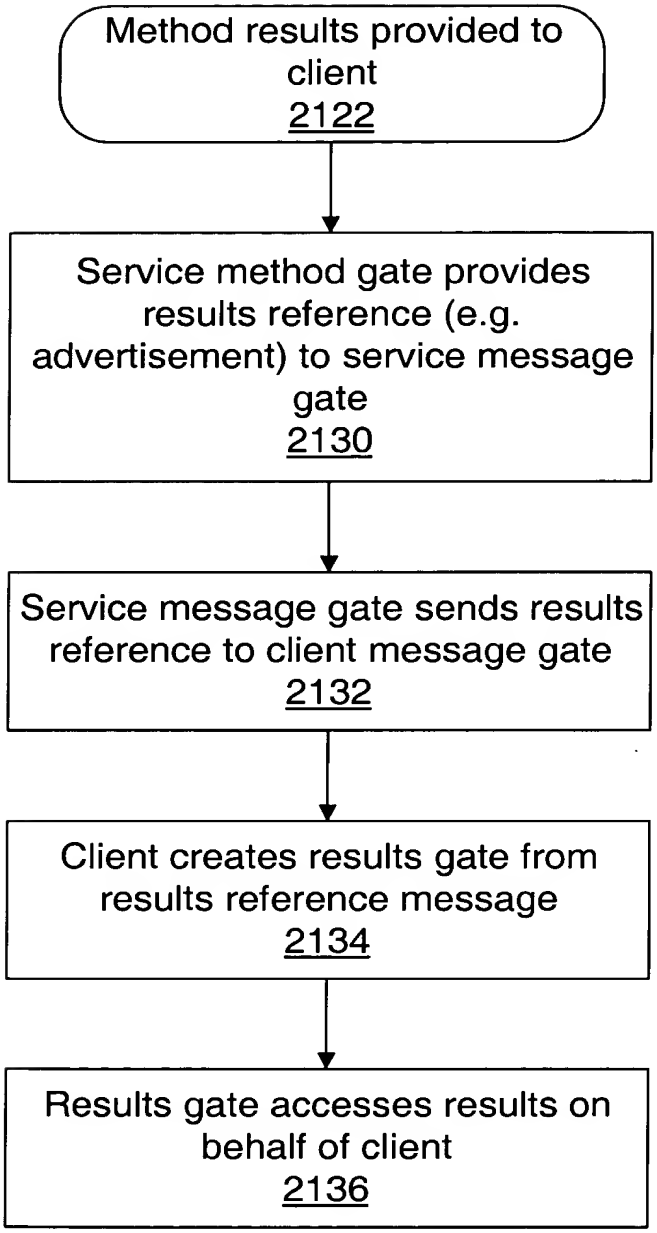


Figure 45d

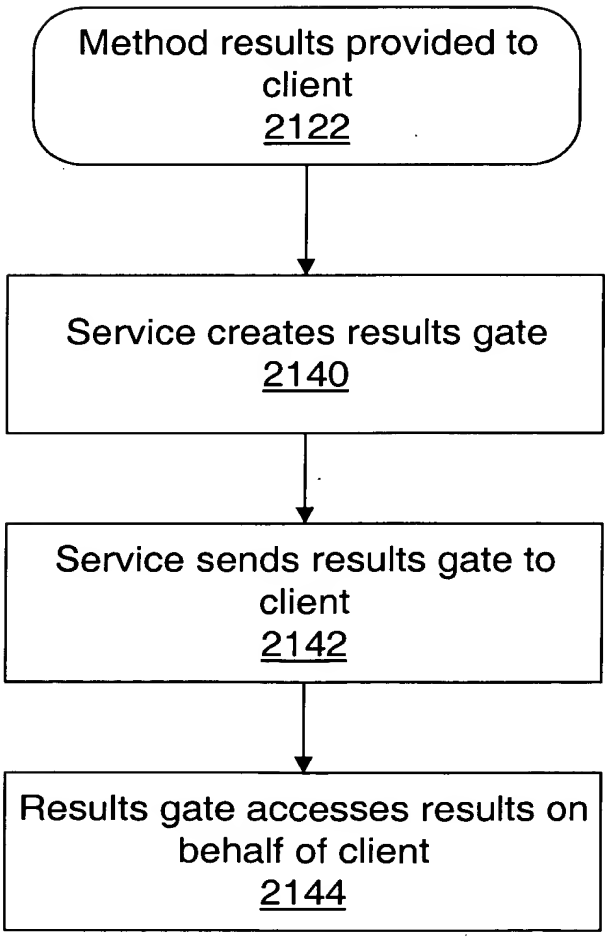


Figure 45e

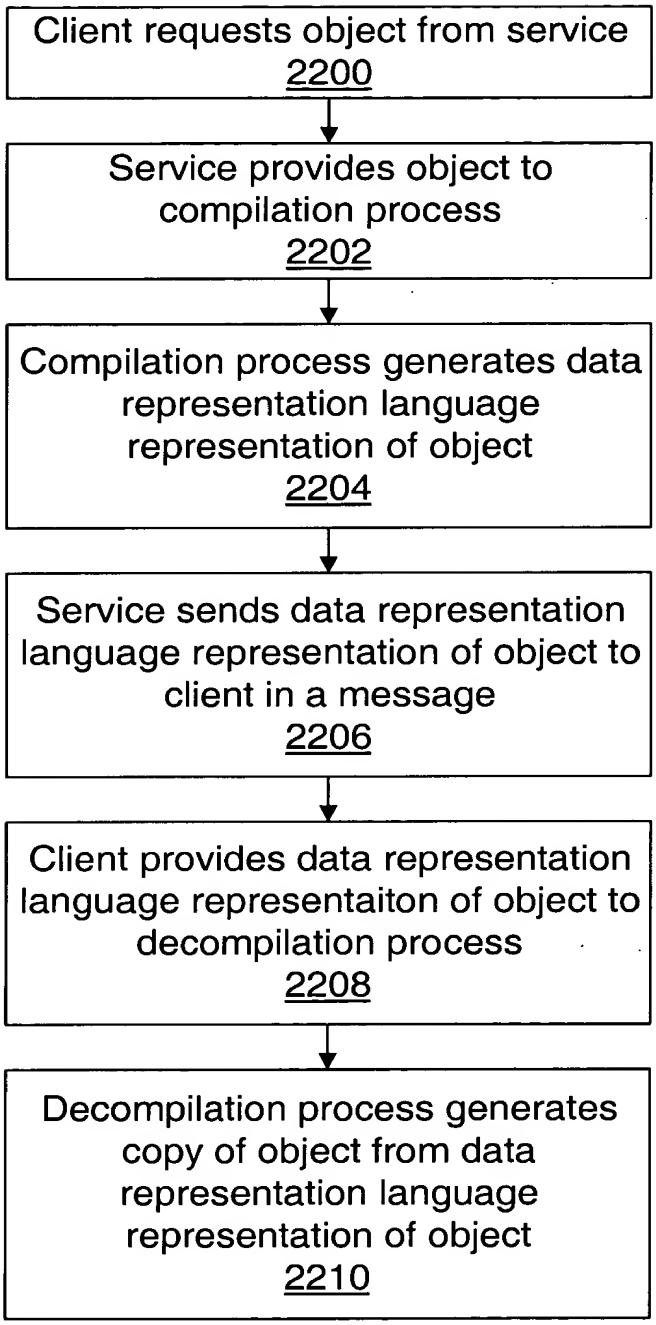

Client requests object from service
2200
Service provides object to compilation process
2202
Compilation process generates data representation language representation of object
2204
Service sends data representation language representation of object to client in a message
2206
Client provides data representation language representaiton of object to decompilation process
2208
Decompilation process generates copy of object from data representation language representation of object
2210

Figure 46

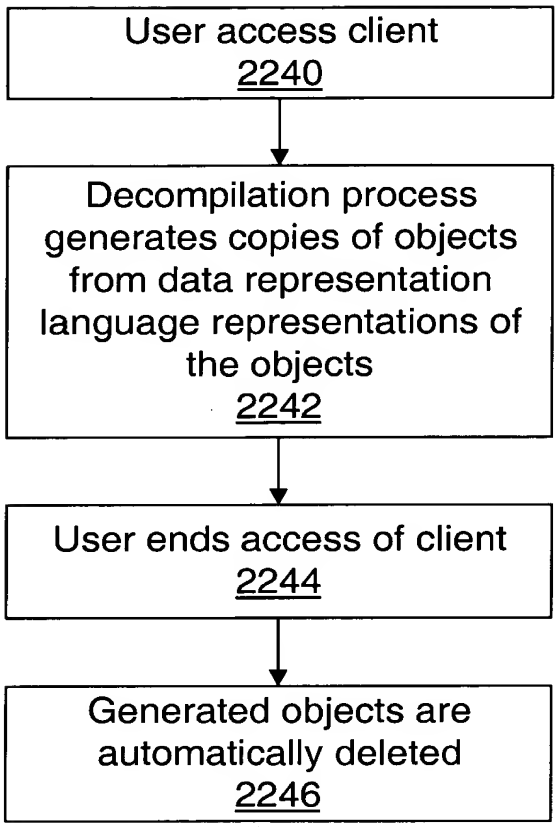

User access client
2240
Decompilation process generates copies of objects from data representation language representations of the objects
2242
User ends access of client
2244
Generated objects are automatically deleted
2246

Figure 47

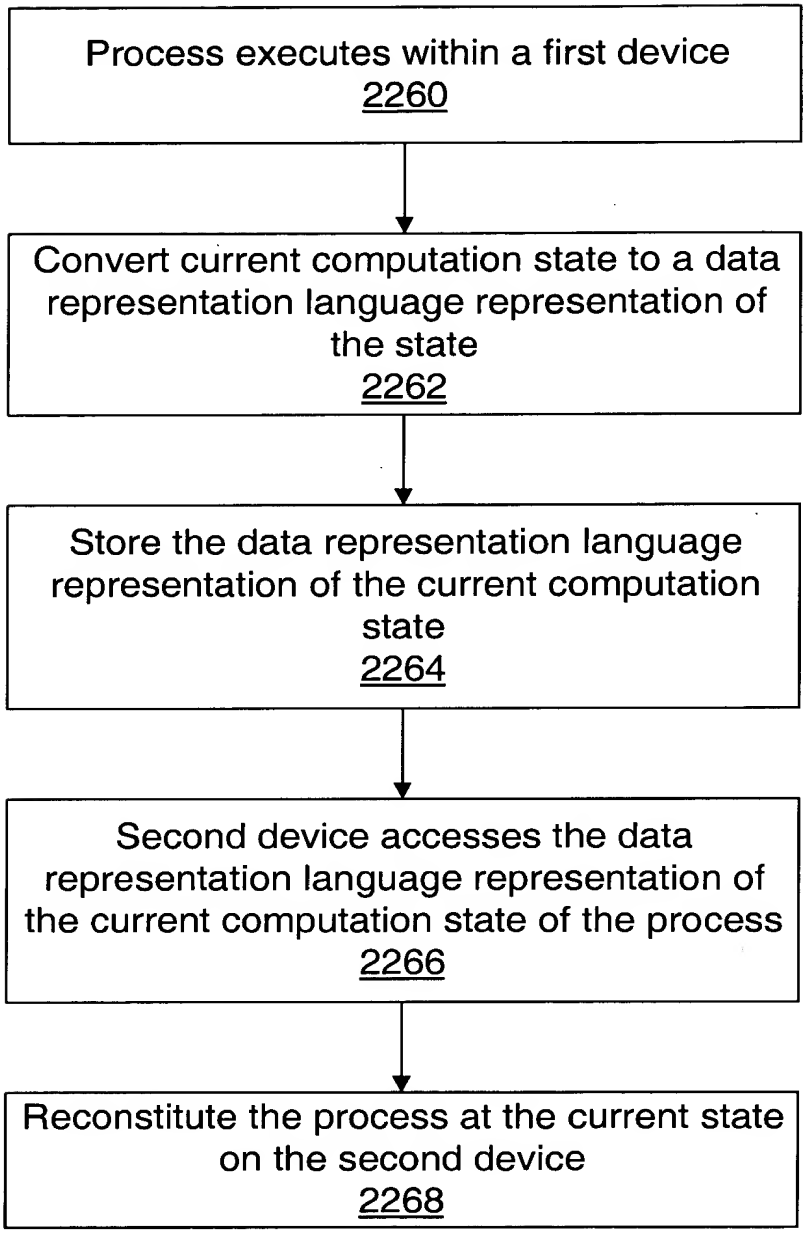

Process executes within a first device
2260
Convert current computation state to a data representation language representation of the state
2262
Store the data representation language representation of the current computation state
2264
Second device accesses the data representation language representation of the current computation state of the process
2266
Reconstitute the process at the current state on the second device
2268

Figure 48

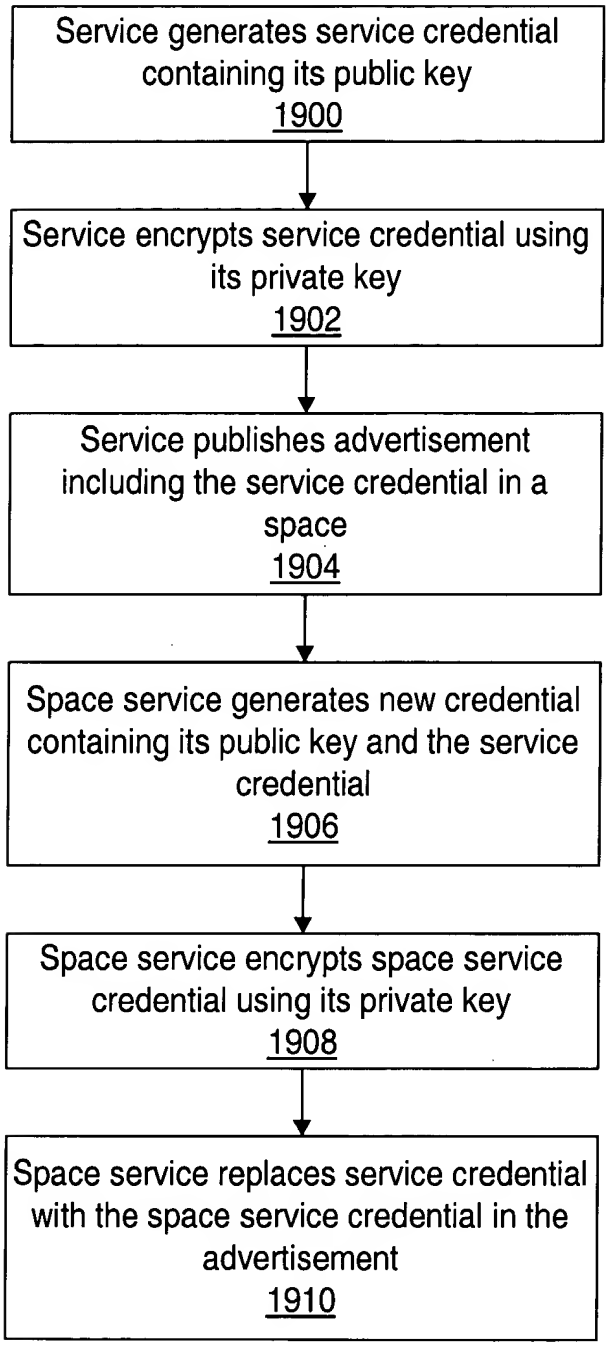


Fig. 49a

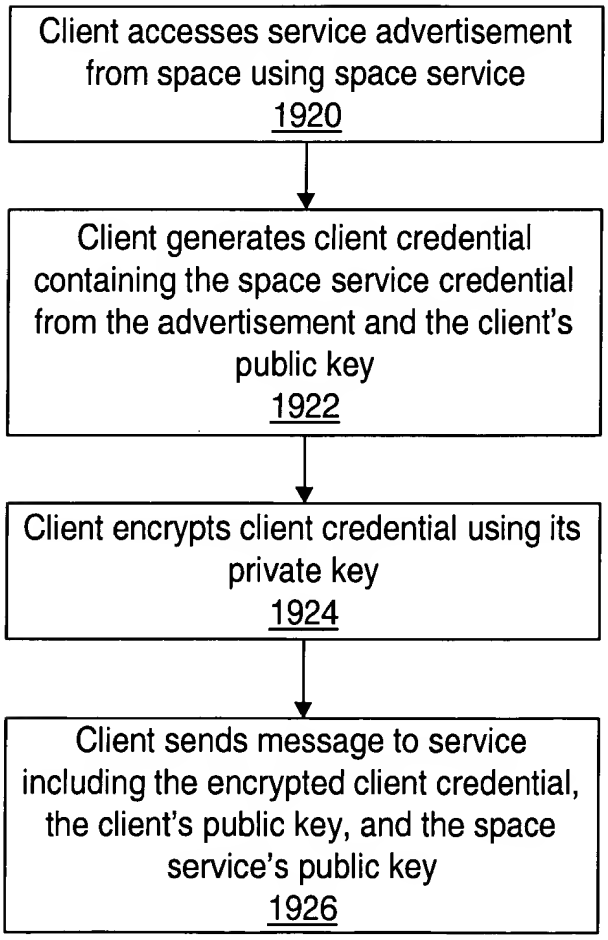


Fig. 49b

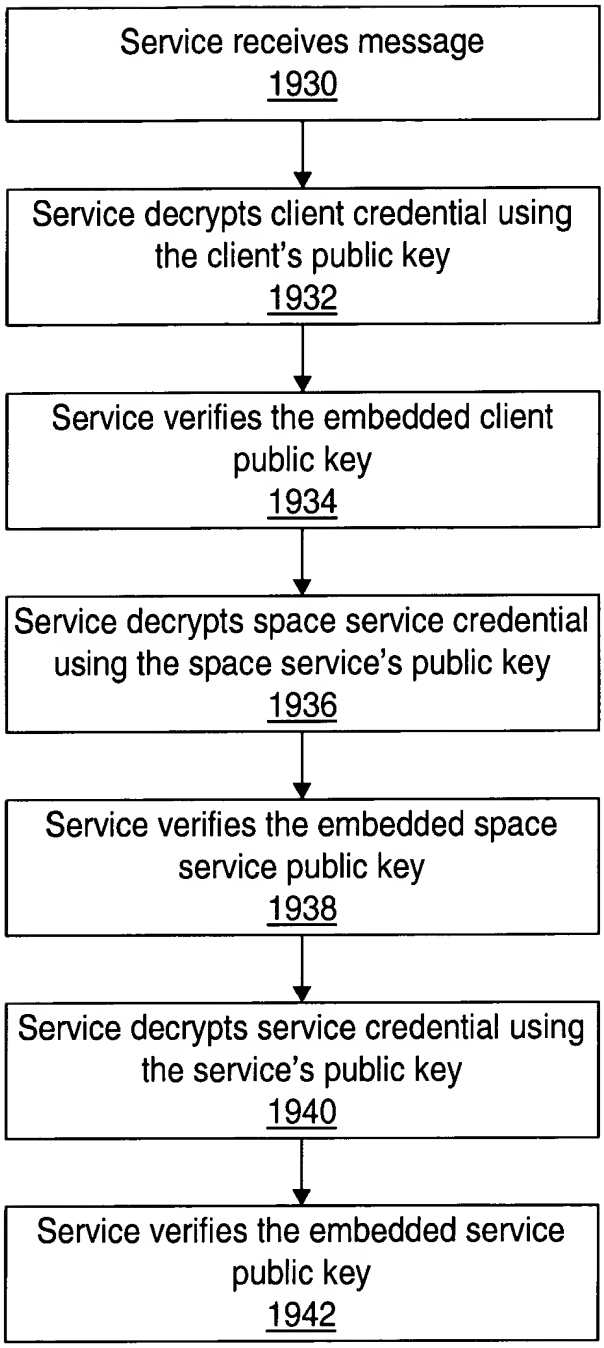

Service receives message
1930
Service decrypts client credential using the client's public key
1932
Service verifies the embedded client public key
1934
Service decrypts space service credential using the space service's public key
1936
Service verifies the embedded space service public key
1938
Service decrypts service credential using the service's public key
1940
Service verifies the embedded service public key
1942

Fig. 49c

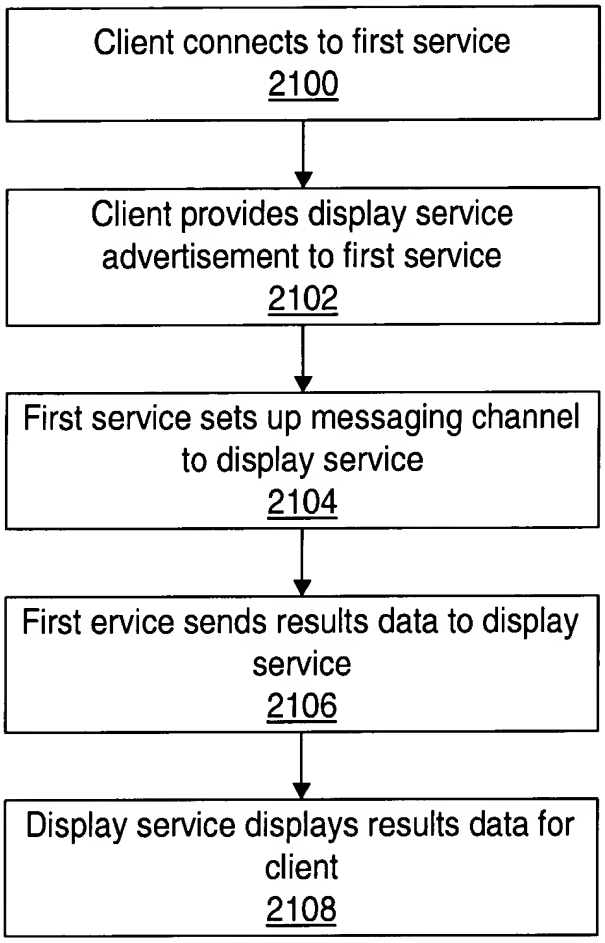

Client connects to first service
2100
Client provides display service advertisement to first service
2102
First service sets up messaging channel to display service
2104
First ervice sends results data to display service
2106
Display service displays results data for client
2108

Fig. 50

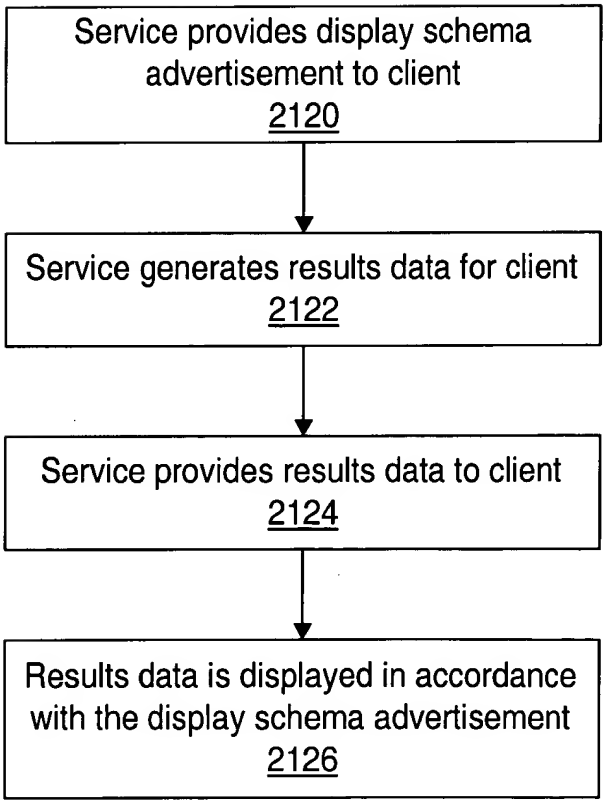

Service provides display schema advertisement to client
2120
Service generates results data for client
2122
Service provides results data to client
2124
Results data is displayed in accordance with the display schema advertisement
2126

Fig. 51